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VOL. XIII. NEH — PA

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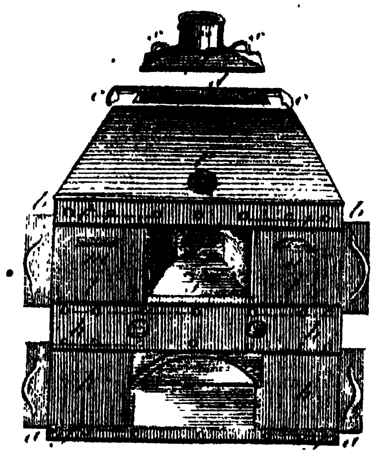

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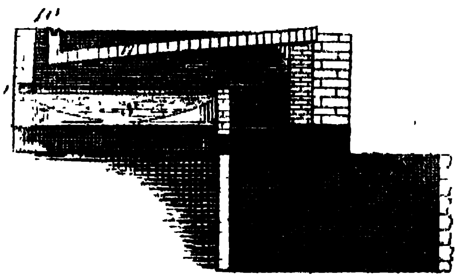

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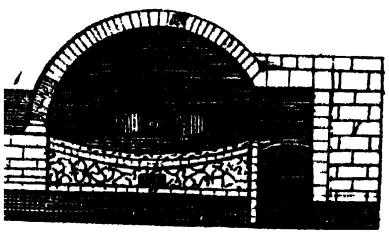

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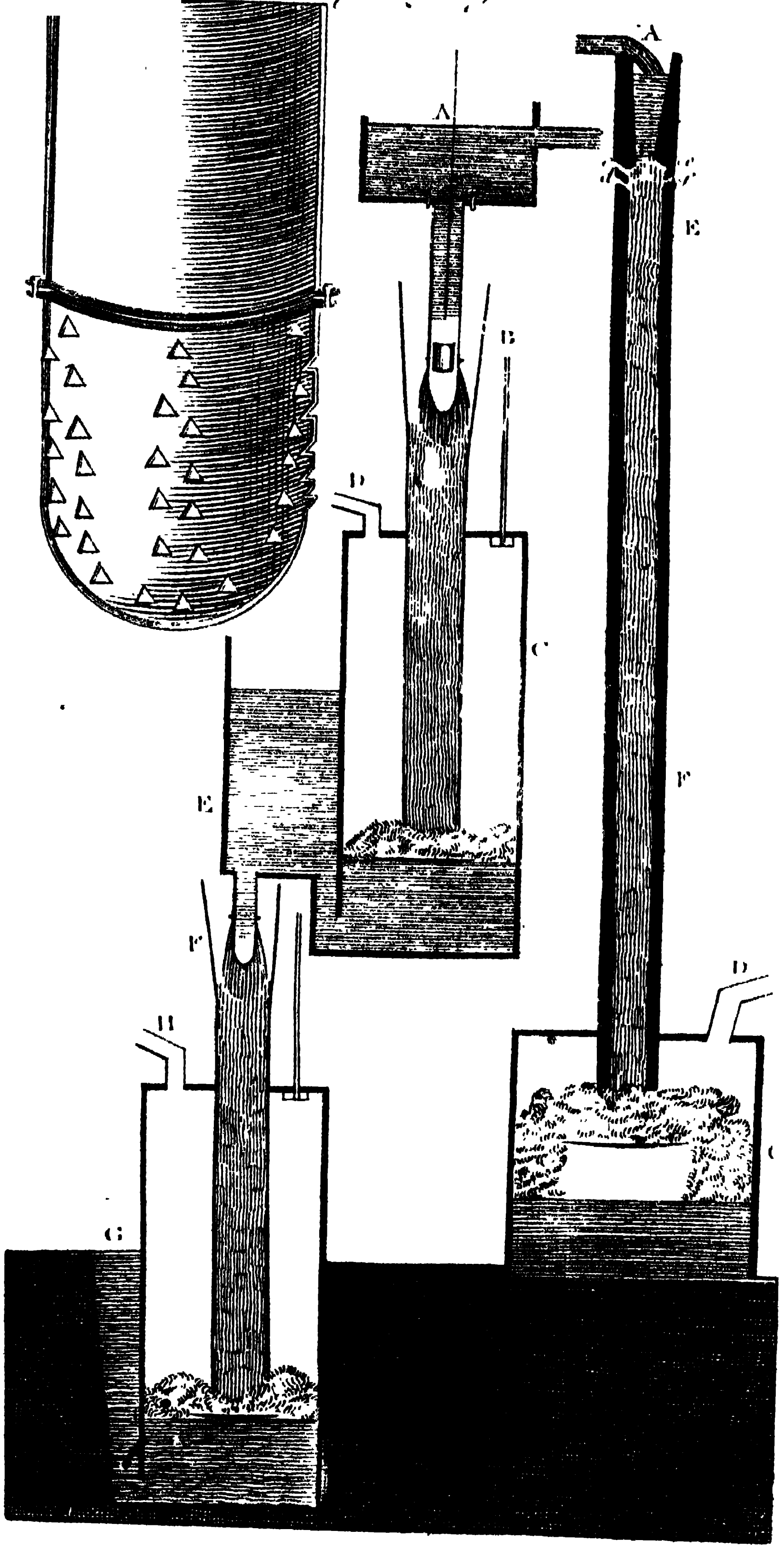

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ENCYCLOPÆDIA BRITANNICA

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Nehemiah.

NEHEMIAH, or Neemias, ſon of Hachaliah, was born at Babylon during the captivity, (Neh. i. 1, 2, &c.) He was, according to ſome, of the race of the prieſts, but, according to others, of the tribe of Judah and the royal family. Thoſe who maintain the firſt opinion, ſupport it by a paſſage in Ezra, (x. 10.) where he is called a prieſt; but thoſe who believe that he was of the race of the kings of Judah, ſay, 1ſt, That Nehemiah having governed the republic of the Jews for a conſiderable time, there is great probability he was of that tribe of which the kings always were. 2dly, Nehemiah mentions his brethren Hanani, and ſome other Jews, who coming to Babylon during the captivity, acquainted him with the ſad condition of their country. 3dly, The office of cup-bearer to the king of Perſia, to which Nehemiah was promoted, is a further proof that he was of an illuſtrious family. 4thly, He excuſes himſelf from entering into the inner part of the temple, probably becauſe he was only a laic, (Neh. vi. 11.) "Should ſuch a man as I flee? And who is there that, being as I am, would go into the temple to ſave his life?"

The Scripture (Ezra ii. 63. Nehem. vii. 65.) calls him תרשתא *tirſhatha*, that is to ſay, "cup-bearer;" for he had this employment at the court of Artaxerxes Longimanus. He had an exceeding great tenderneſs for the country of his fathers, though he had never ſeen it; and one day, as ſome Jews newly come from Jeruſalem acquainted him with the miſerable eſtate of that city, that its walls were beat down, its gates burnt, and the Jews were become a reproach among all nations; he was ſenſibly affected with this relation; he faſted, prayed, and humbled himſelf before the Lord, that he would be favourable to the deſign he had then conceived of aſking the king's permiſſion to rebuild Jeruſalem. The courſe of his attendance at court being come, he preſented the cup to the king according to cuſtom; but with a countenance ſad and dejected; which the king obſerving, entertained ſome ſuſpicion, as if he might have had ſome bad deſign; but Nehemiah (ii.) diſcovering the occaſion of his diſquiet, Artaxerxes gave him leave to go to Jeruſalem, and repair its walls and gates: but, however, upon this condition, that he ſhould return to court at a time appointed. Letters were made out, directed to the governors beyond the Euphrates, with orders to furniſh Nehemiah with timbers neceſſary for covering the towers and gates of the city, and the houſe deſigned for Nehemiah himſelf, who was now appointed governor of Judea, in the year of the world 3350.

Nehemiah being arrived at Jeruſalem with the king's commiſſion, went round the city; and having viewed the condition of the walls, aſſembled the chief of the people, produced his commiſſion, and exhorted them to undertake the reparation of the gates and walls of the city. He found every perſon ready to obey him; whereupon he immediately began the work. The enemies of the Jews, obſerving theſe works in ſuch forwardneſs, made uſe of all the means in their power to deter Nehemiah from this undertaking, and made ſeveral attempts to ſurpriſe him; but finding that their deſigns were diſcovered, and that the Jews kept upon their guard, they had recourſe to craft and ſtratagem, endeavouring to draw him into an ambuſcade in the fields, where they pretended they would finiſh the diſpute at an amieable conference: but Nehemiah gave them to underſtand, that the work he had begun required his perſonal attendance; and therefore he could not come to them. He ſent the ſame anſwer to four ſeveral meſſages that they ſent one after another on the ſame ſubject, (*Id.* iv. and vi.)

Sanballat, the chief of the enemies of the Jews, together with his aſſociates, wrote word, that a report was ſpread that the Jews were building the walls of Jeruſalem only with a deſign to make it a place of ſtrength, to ſupport them in an intended revolt; that it was ſaid alſo that Nehemiah had ſuborned falſe prophets to favour his deſigns, and to encourage the people to chooſe him king; and to ſtop the courſe of theſe rumours, he adviſed him to come to him, that they might confer together, and take ſuch reſolutions as ſhould be found convenient. Nehemiah gave himſelf no trouble on this account, but returned for anſwer, that all thoſe accuſations were falſe and made at random. About the ſame time he diſcovered, that a falſe prophet, called *Shemaiah*, had been corrupted by his enemies, and that ſome of the chief of the city were ſecretly in confederacy with them. Yet all this did not diſcourage him: he went on with his work, and happily completed it in two and fifty days after it had been begun.

Then he made a dedication of the walls, of the towers, and of the gates of Jeruſalem, with the ſolemnity and magnificence that ſuch a work required. He ſeparated the prieſts, the Levites, and the princes of the people, into two companies, one of which walked to the ſouth and the other to the north, on the top of the walls. Theſe two companies were to meet at the temple. The proceſſion was accompanied with muſic both vocal and inſtrumental: and when they were all come to the temple, they there read the law, offered ſacrifices, and made great rejoicings. And as the feaſt of tabernacles happened at the ſame time, it was celebrated with great ſolemnity, (*Id.* viii.) Nehemiah obſerving that the compaſs of the city was too large for its inhabitants, he ordered that the chief of the nation ſhould fix their dwelling in the city; and cauſed them to draw lots, by which a tenth part of the whole people of Judah were to dwell at Jeruſalem, (*Id.* xi.) Then he applied himſelf to the reformation of ſuch abuſes as had crept into the adminiſtration of the public affairs. He curbed the inhumanity of the great ones, who held in a ſtate of ſlavery the ſons and daughters of thoſe who were poor or unfortunate, keeping their lands in poſſeſſion, which theſe poor people had been obliged either to mortgage or to ſell to the rich. Another abuſe there was, which Ezra had in vain attempted to redreſs, that they had contracted marriages with ſtrange and idolatrous women. Nehemiah undertook to diſſolve theſe marriages, ſucceeded in it, and ſent away all ſuch women as had been taken againſt the expreſs command of the law, (*Id.* ix.) Having likewiſe obſerved, that the prieſts and Levites were obliged to take refuge wherever they could, and ſo the miniſtry of the temple was not attended or performed with that decency it ought, becauſe they did not receive the revenues that the law had appointed for their ſubſiſtence; he obliged the people punctually to pay the miniſters of the Lord what was due to them, and enjoined the prieſts and Levites duly to attend on their reſpective duties, and to diſcharge their functions, (*Id.* xiii. 10, 11, &c.) He enforced the obſervation of the ſabbath, which had been much neglected at Jeruſalem, and would not permit ſtrangers to come in to buy and ſell, but kept the gates of the city ſhut all that day. And, to perpetuate as much as was poſſible theſe good regulations which he had newly eſtabliſhed, he engaged the chief men of the nation ſolemnly to renew the covenant with the Lord. This ceremony was performed in the temple, and an inſtrument was drawn up, which was ſigned by the principal men, both prieſts and people, (*Id.* ix. x.) in the year of the world 3551.

We read in the books of Maccabees, (2 Macc. i. 19, 20, 21, &c.) that Nehemiah ſent to ſearch for the holy fire, which before the captivity of Babylon the prieſts had hid in a dry and deep pit; but not finding any fire there, but inſtead thereof a thick and muddy water, he ſprinkled this upon the altar; whereupon the wood which had been ſprinkled with this water took fire preſently as ſoon as the ſun began to appear. Which miracle coming to the knowledge of the king of Perſia, he cauſed the place to be encompaſſed with walls where the fire had been hid, and granted great favours and privileges to the prieſts. It is recorded in the ſame books, (2 Macc. ii. 13, 14.) that Nehemiah erected a library, wherein he placed whatever he could find, either of the books of the prophets, of David, or of ſuch princes as had made preſents to the temple. Laſtly, He returned to Babylon (*Id.* v. 14. and xiii. 6.) according to the promiſe he had made to King Artaxerxes, about the thirty ſecond year of this prince, in the year 3563. From thence he returned again to Jeruſalem, where he died in peace, about the year 3580, having governed the people of Judah for about thirty years.

The book which in the Engliſh Bible, as alſo in the Hebrew, has the name of *Nehemiah*, in the Latin Bible is called the book of *Eſdras;* and it muſt be confeſſed, that though this author ſpeaks in the firſt perſon, and though at firſt reading one would think that he had writ it day by day as the tranſactions occurred, yet there are ſome things in this book which could not have been written by Nehemiah himſelf; for example, memorials are quoted wherein were regiſtered the names of the prieſts in the time of Jonathan the ſon of Eliaſhib, and even to the times of the high prieſt Jaddus, who met Alexander the Great. Theſe therefore muſt have been added afterwards.

It may well be queſtioned, whether this Nehemiah be the ſame that is mentioned in Ezra, (ii. 2. and Neh. vii. 7.) as one that returned from the Babyloniſh captivity under Zerubbabel; ſince from the firſt year of Cyrus to the twentieth of Artaxerxes Longimanus, there are no leſs than ninety-two years intervening; ſo that Nehemiah muſt at this time have been a very old man, upon the loweſt computation an hundred, conſequently utterly incapable of being the king's cup-bearer, of taking a journey from Shuſhan to Jeruſalem, and of behaving there with all the courage and activity that is recorded of him. Upon this preſumption, therefore, we may conclude that this was a different perſon, though of the ſame name, and that Tirſhatha (the other name by which he is called, Ezra ii. 63. and Neh. vii. 65.) denotes the title of his office, and both in the Perſian and Chaldean tongues was the general name given to the king's deputies and governors.

NEHOW, one of the Sandwich iſlands, diſcovered by Captain Cook in his laſt voyage to the Pacific ocean: they are eleven in number, and are ſituated from 18° 44′ to 22° 15′ N. Lat. and from 154° 56′ to 160° 24′ W. Long. They are not very particularly deſcribed in any account that has hitherto appeared.

NEIGHBOUR, 1. One who dwells or is ſeated near to another (2 Kings iv. 3.) 2. Every man to whom we have an opportunity of doing good (Matt. xxii. 39.) 3. A fellow labourer of one and the ſame people (Act. vii. 27.) 4. A friend (Job xvi. 21.) At the time of our Saviour, the Phariſees had reſtrained the word neighbour to ſignify thoſe of their own nation only, or their own friends; being of opinion that to hate their enemy was not forbidden by their law. But our Saviour informed them, that the whole world were their neighbours; that they ought not to do to another what they would not have done to themſelves; and that this charity ought to be extended even to their enemies (Matt. v. 43. Luke x. 29, &c.)

NEISSE, a handſome town of Sileſia in Germany, and the reſidence of the biſhop of Breſlaw, who has a magnificent palace here. The air is very wholeſome, and proviſions are cheap; the inhabitants carry on a great trade in wine and linen. This place ſuffered greatly by an inundation and fire in 1729. It was taken by the Pruſſians in 1741, who augmented the fortifications after the peace in 1742, and built a citadel to which they gave the name of *Pruſſia*. It is ſeated on a river of the ſame name, in E. Long. 17. 35. N. Lat. 50. 32.

NEIUS MONS (anc. geog.), at the foot of which ſtood Ithaca, a town of the iſland of that name, (Homer).

Nelſon.

NELSON (Robert), a learned and pious Engliſh gentleman, was the ſon of Mr John Nelſon a conſiderable Turkey merchant, and was born in June 1656. He had the firſt part of his education at St Paul's ſchool, London; but the principal part was under a private tutor in his mother's houſe, after which he ſtudied at Trinity College, Cambridge. In 1680 he was choſen a fellow of the Royal Society; being probably inclined to receive that honour out of reſpect to his friend and ſchoolfellow Dr Edmund Halley, for whom he had a particular regard, and in whoſe company he ſet out on his travels abroad the December following. In the road to Paris, they ſaw the remarkable comet which gave riſe to the cometical aſtronomy by Sir Iſaac Newton; and our author, apparently by the advantage of his fellow traveller's inſtructions, ſent a deſcription of it to Dr, afterwards Archbiſhop, Tillotſon, by whom he was very much eſteemed. Before he left Paris, he received a letter from a friend in the Engliſh court, inviting him to purchaſe a place there, by the promiſe of his aſſiſtance in it. This propoſal was made by Mr Henry Saville, brother to Lord Hallifax: he had been ſworn vice-chamberlain of the King's houſhold in December 1680, and was at this time envoy from Charles II. of the court of France; though now at London, whence he ſent this offer in a letter to Mr Nelſon; who, being but young, and having a great affection for King Charles and the duke of York, was pleaſed with the thoughts of figuring it near their perſons; but as he could not reſolve upon an affair of ſuch conſequence without the approbation of his mother and uncle, he firſt applied to Tillotſon to ſound them, with aſſurances of determining himſelf by their judgment and advice, including alſo that of the Dean: who finding them both averſe to it, he thereupon dropped the matter, and purſued his journey with his fellow traveller to Rome. Here he fell into the acquaintance of Lady Theophila Lucy, widow of Sir Kingſmill Lucy of Broxburne in Hertfordſhire, Bart. and ſecond daughter of George earl of Berkeley, who ſoon diſcovered a ſtrong paſſion for him: this concluded in marriage, after his arrival in England in 1682. But it was ſome time before ſhe confeſſed to Mr Nelſon the change of her religion; which was owing to her acquaintance with Boſſuet, and converſations at Rome with Cardinal Philip Howard, who was grandſon of the earl of Arundel, the collector of the Arundelian marbles, &c. and had been raiſed to the purple by Pope Clement X. in May 1675. Nor was this important alteration of her religious ſentiments confined to her own mind, but involved in it her daughter by her firſt huſband, whom ſhe drew over to her new religion; and her zeal for it prompted her even to engage in the public controverſy then depending. She is the ſuppoſed authoreſs of a piece written in 1686, 4to, under the title of, "A diſcourſe concerning a judge of controverſy in matters of religion, ſhowing the neceſſity of ſuch a judge."

This misfortune touched her huſband very nearly. He employed not only his own pen, but thoſe of his friends Dr Tillotſon and Dr Hickes, to recover her; but all proved ineffectual; and ſhe continued in the communion of the church of Rome till her death. She was a perſon of fine ſenſe and underſtanding. Dr Tillotſon particularly laments her caſe on that account; and even ſeems not to be entirely free from all apprehenſions of the influence ſhe might have upon her huſband in this important affair. But Mr Nelſon's religion was too much the reſult of his learning and reaſon to be ſhaken by his love, which was equally ſteady and inviolable. Her change of religion made no change in his affections for her; and when ſhe relapſed into ſuch a bad ſtate of health as obliged her to go and drink the waters at Aix, he attended her thither in 1688: and not liking the proſpect of the public affairs at home, he proceeded to make a ſecond trip to Italy, taking his lady, together with her ſon and daughter by her former huſband, along with him. He returned through Germany to the Hague, where he ſtaid ſome time with Lord Durſley, who was married to his wife's ſiſter.

From the Hague he arrived in England, in the latter end of 1691; where, being averſe to the Revolution, he declared himſelf a Nonjuror, and left the communion of the church of England. In this laſt point he had conſulted Dr Tillotſon, and followed his opinion, who thought it no better than a trick, (deteſtable in any thing, and eſpecially in religion), to join in prayers where there was any petition which was held to be ſinful. Thus, notwithſtanding their difference of opinion reſpecting the lawfulneſs of the Revolution, the friendſhip between them remained the ſame; and the good archbiſhop expired in his friend's arms in 1694. Nor did Mr Nelſon's friendſhip end there; he continued it to his grace's widow, and was very inſtrumental in procuring her penſion from the crown to be augmented from 400l. to 600l. *per annum*. It is very remarkable, that the great regard he had always ſhown to Tillotſon, added to his own reputation for learning, judgment, and candour, induced Dr Barker, who publiſhed the archbiſhop's poſthumous ſermons, to conſult our author on that occaſion. Among the manuſcripts, there was found one diſcourſe wherein the archbiſhop took an occaſion to complain of the uſage which he had received from the Nonjuring party, and to expoſe, in return, the inconſiſtency of their own conduct; remarking particularly, that, upon a juſt compariſon of their principle of non-reſiſtance with their actual non-aſſiſtance to King James II. they had little reaſon to boaſt of their loyalty to him: and yet, ſevere as this diſcourſe was upon that party, Mr Nelſon, notwithſtanding his attachment to them, was very zealous to have it printed, alleging, that they deſerved ſuch a rebuke for their unjuſt treatment of ſo good a man. However, the ſermon was then ſuppreſſed, and is now probably loſt.

Our author's new character unavoidably threw him into ſome new connexions. Among theſe we find mentioned particularly Mr Kettlewell, who had reſigned his living at Coleſhill in Warwickſhire on account of the new oaths, and afterwards reſided in London. This pious and learned divine alſo agreed with him, in leaving the communion of the eſtabliſhed church; yet at the ſame time perſuaded him to engage in the general ſervice of piety and devotion; obſerving to him, that he was very able to compoſe excellent books of that kind, which would be apt to do more good as coming from a layman. This addreſs

Nelſon.

correſponded with the truly catholic ſpirit of our author; who accordingly publiſhed many works of piety, which are deſervedly eſteemed. Indeed it was this ſpirit, more than their agreement in ſtate principles, that firſt recommended them to one another. Mr Nelſon is obſerved to have encouraged Kettlewell to proceed in that ſoft and gentle manner, in which he excelled, in managing the Nonjurors controverſy; and animated him beſides to begin and proſecute ſome things for a public good, which otherwiſe would not have ſeen the light. Mr Kettlewell died in 1695, and left Mr Nelſon his ſole executor and truſtee; in conſequence of which, he publiſhed a poſthumous piece of piety, entitled, "An Office for Priſoners," &c. in 1697. He alſo publiſhed five other of his friend's poſthumous pieces, and furniſhed the chief materials for the account of his life afterwards.

At the ſame time he engaged zealouſly in every public ſcheme for the honour and intereſt, as well as for propagating the faith, and promoting the practice, of true Chriſtianity, both at home and abroad; ſeveral propoſals for building, repairing, and endowing churches, and charity ſchools particularly.

Upon the death of Dr William Lloyd, the deprived biſhop of Norwich, in the end of the year 1709, he returned to the communion of the church of England. Dr Lloyd was the laſt ſurviving of the deprived biſhops by the Revolution, except Dr Kenn, by whoſe advice Mr Nelſon was determined in this point. It had been a caſe in view ſome time, which had been bandied on both ſides, whether the continuance of their ſeparation from the church ſhould be ſchiſmatical or no, when that caſe became a fact; and our author had ſome conferences upon it with Dr Hickes, who was for perpetuating the Nonjuring church, and charging the ſchiſm upon the church eſtabliſhed. (See an account of this diſpute, with ſome letters that paſſed between them on the occaſion, in "The Conſtitution of the Catholic church, and the nature and conſequences of Schiſm ſet forth, in a collection of papers written by the late George Hickes, D. D. 1716," 8vo.) Mr Nelſon's tutor, Dr George Bull, biſhop of St David's, dying before the expiration of this year, he was eaſily prevailed upon by that prelate's ſon to draw up an account of his father's life and writings, as he had maintained a long and intimate friendſhip with his lordſhip, which gave him an opportunity of being acquainted with his ſolid and ſubſtantial worth. The life was publiſhed in 1713; and as our author had long before laboured under a conſtitutional weakneſs, which had brought on an aſthma and dropſy in the breaſt, the diſtemper grew to ſuch a height ſoon after the publication of that work, that, for the benefit of the air, he retired at length to Kenſington, where he expired on the 16th of January 1714-15, aged 59.

He was interred in the cemetery of St George's chapel, now a parochial church in Lamb's Conduit Fields, where a monument is erected to his memory, with a long and elegant Latin inſcription, written by Biſhop Smalridge. He was the firſt perſon buried in this cemetery; and as it was done to reconcile others to the place, who had taken an inſurmountable prejudice againſt it, ſo it proved a moſt prevailing precedent, and had the deſired effect. He publiſhed ſeveral works of piety, and left his whole eſtate to pious and charitable uſes, particularly to charity-ſchools. A good portrait of him was given by Mr Nichols, in 1779, to the Company of Stationers, and is placed in the parlour of their public hall. After the death of Sir Berkeley Lucy, Mr Nelſon's library was ſold by auction in 1760, together with that of Sir Berkeley, forming, united, a moſt extraordinary aſſemblage of devotion and infidelity. Several of Mr Nelſon's original letters, highly characteriſtic of his benevolence, may be ſeen in the Anecdotes of Bowyer. Mr Nichols has alſo in his poſſeſſion in MS. two excellent letters of advice from Mr Nelſon to his young couſins George and Gabriel Hanger, on their going to ſettle in Turkey; which have been obligingly offered for the uſe of any future biographer, but are too long for our limits.

NEMAUSUS, or Nemausum, (anc. geog.), the capital of the Arecomici in Gallia Narbonenſis; a colony, (Coin), with the ſurname *Auguſta*, (Inſcription). In it ſtands a Roman amphitheatre, which is ſtill almoſt entire. Now *Niſmes* in Languedoc.

NEMEA (Strabo, Livy); a river of Achaia, running between Sicyon and Corinth, the common boundary of both territories, and falling into the Corinthian bay.

Nemea (anc. geog.), ſituated between Cleonæ and Philus in Argolis; whether town, diſtrict, or other thing, uncertain; there a grove ſtood in which the Argives celebrated the Nemean games, and there happened all the fabulous circumſtances of the Nemean lion. The diſtrict Nemea is called *Bembinadia*, (Pliny); a village, *Bembina*, ſtanding near Nemea, (Strabo). Stephanus places Nemea in Elis; though not in Elis, but on its borders; Pliny, erroneouſly, in Arcadia. In the adjoining mountain is ſtill ſhown the den of the lion, diſtant 15 ſtadia from the place *Nemea*, (Pauſanias); in which ſtands a conſiderable temple of Jupiter Nemæus and Cleonæus, from the vicinity of theſe two places. This place gave name to the Nemæan games, celebrated every third year.

NEMEAN games, ſo called from Nemea, a village between the cities of Cleonæ and Philus, where they were celebrated every third year. The exerciſes were chariot-races, and all the parts of the Pentathlum. Theſe games were inſtituted in memory of Opheltes or Archemorus the ſon of Euphetes and Creuſa, and who was nurſed by Hypſipele; who leaving him in a meadow while ſhe went to ſhow the beſiegers of Thebes a fountain, at her return found him dead, and a ſerpent twined about his neck: whence the fountain, before called *Langia*, was named *Archemorus*; and the captains, to comfort Hypſipele, inſtituted theſe games.—Others aſcribe their inſtitution to Hercules, after his victory over the Nemean lion. Others allow, that they were inſtituted firſt in honour of Archemorus; but intermitted, and revived again by Hercules. The victors were crowned with parſley, an herb uſed at funerals, and feigned to have ſprung from Archemorus's blood. The Argives preſided at theſe games.

NEMESIANUS (Aurelius Olympius), a Latin poet who was born at Carthage, and flouriſhed about the year 281, under the emperor Carus, and his ſons Carinus and Numerian: the laſt of which emperors was ſo fond of poetry that he conteſted the glory with

Nemeſianus, who had written a poem upon fiſhing and maritime affairs. We have ſtill remaining a poem of our author called *Cynegeticon*, and four eclogues: they were publiſhed by Paulus Manutius in 1538; by Barthelet in 1613; at Leyden in 1653; with the notes of Janus Vlitias. Giraldi hath preſerved a fragment of Nemeſianus, which was communicated to him by Sannazarius, to whom we are obliged for our poet's works: for having found them written in Gothic characters, he procured them to be put into the Roman, and then ſent them to Paulus Manutius. Although this poem hath acquired ſome reputation, it is greatly inferior to thoſe of Oppian and Gratian upon the ſame ſubject; yet Nemeſianus's ſtyle is natural enough, and has ſome degree of elegance. The world was ſo much poſſeſſed with an opinion of his poem in the eighth century, that it was read among the claſſics in the public ſchools, particularly in the time of Charlemagne, as appears from a letter of the celebrated Hincmar biſhop of Rheims to his nephew Hincmar of Laon.

NEMESIS, in Pagan worſhip, the daughter of Jupiter and Neceſſity, or, according to others, of Oceanus and Nox, had the care of revenging the crimes which human juſtice left unpuniſhed. She was alſo called *Adraſtæa*, becauſe Adraſtus king of Argos firſt raiſed an altar to her; and *Rhamnuſia*, from her having a magnificent temple at Rhamnus in Attica. She had likewiſe a temple at Rome in the Capitol. She is repreſented with a ſtern countenance, holding a whip in one hand and a pair of ſcales in the other.

NEMESIUS, a Greek philoſopher who embraced Chriſtianity, and was made biſhop of Emeſa in Phœnicia, where he had his birth; he flouriſhed in the beginning of the fifth century. We have a piece by him entitled *De Natura Hominis*, in which he refutes the fatality of the Stoics and the errors of the Manichees, the Apollianariſts, and the Eunomians; but he eſpouſes the opinion of Origen concerning the pre-exiſtence of ſouls (A). This treatiſe was tranſlated by Valla, and printed in 1535. Another verſion was afterwards made of it by Ellebodius, and printed in 1665; it is alſo inſerted in the *Bibliotheca Patrum*, in Greek and Latin. Laſtly, Another edition was publiſhed at Oxford in 1671, folio, with a learned preface, wherein the editor endeavours to prove, from a paſſage in this book, that the circulation of the blood was known to Nemeſius; which, however, was ſince ſhown to be a miſtake by Dr Freind, in his *Hiſtory of Phyſic*.

NEMINE CONTRADICENTE, "none contradicting it;" a term chiefly uſed in parliament when any thing is carried without oppoſition.

NEMOURS, a town of the Iſle of France in the Gatinois, with the title of a duchy. It is ſeated on the river Loing, in E. Long. 2. 45. N. Lat. 48. 15.

NENAGH, a poſt and fair town of Ireland, in the county of Tipperary, and province of Munſter, 75 miles from Dublin. It is ſituated on a branch of the river Shannon which runs into Lough-Derg. Here ſtands the ruins of an old caſtle called Nenagh-round. Alſo thoſe of an hoſpital founded in the year 1200, for canons following the rule of St Auguſtin. It was dedicated to St John the Baptiſt, and was uſually called *Tearhon*, or St John's houſe. In the reign of Henry III. a friary for conventual Franciſcans was alſo founded here, and eſteemed the richeſt foundation of that order in the kingdom. Here is a barrack for two troops of horſe. This town was burnt on St Stephen's day 1348, by the Iriſh. The fairs held here are four.

NENIA, or NÆNIA, in the ancient poetry, a kind of funeral ſong ſung to the muſic of flutes at the obſequies of the dead. Authors repreſent them as ſorry compoſitions, ſung by hired women mourners called *Præficæ*. The firſt riſe of theſe Nenia is aſcribed to the phyſicians. In the heathen antiquity, the goddeſs of tears and funerals was called *Nenia*; whom ſome ſuppoſe to have given that name to the funeral ſong, and others to have taken her name from it.

NEOCESARIA, (Pliny), a town of Pontus on the ſouth or the left ſide of the Lycus. About the year 342, when Leontius and Salluſtius were conſuls, it was entirely ruined by a dreadful earthquake, no edifice having withſtood the violence of the ſhock, except the church and the biſhop's habitation, who was ſaved, with the clergy and ſome other pious perſons, while the reſt of the inhabitants were buried in its ruins.

NEOMAGUS, (Ptolemy); NOVIOMAGUS, (Antonine); a town of the Regni in Britain: now thought to be Guildford in Surry, (Lhuyd); or Croydon, (Talbot.) But Camden takes it to be Woodcote, two miles to the ſouth of Croydon, where traces of an ancient town are ſtill to be ſeen.

NEOMAGUS, (Ptolemy); *Noviomagus*, (Antonine); a town of the Treviri on the Moſelle. Now *Numagen* 14 miles eaſt, below Triers.

NEOMAGUS, (Ptolemy); *Noviomagus Lexoviorum*, (Antonine); a town of Gallia Celtica. Now *Liſeux*, in Normandy.

NEOMAGUS, (Ptolemy), *Noviomagus Nemetum*, (Antonine.) Now *Spire*, a city of the Palatinate, on the left or weſt ſide of the Rhine.

NEOMAGUS, (Ptolemy); a town of Gallia Narbonenſis, on the confines of the Tricaſtini. Now *Nyons* in Dauphiné.

NEOMENIA, or NOUMENIA, a feſtival of the ancient Greeks, at the beginning of every lunar month, which, as the name imports, was obſerved upon the day of the new moon, in honour of all the gods, but eſpecially Apollo, who was called *Neomenios*, becauſe the ſun is the fountain of light; and whatever diſtinction of times and ſeaſons may be taken from other planets, yet they are all owing to him as the original of thoſe borrowed rays by which they ſhine.

The games and public entertainments at theſe feſtivals were made by the rich, to whoſe tables the poor flocked in great numbers. The Athenians at theſe

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(A) It is much more probable that he and Origen both brought their opinion with them from the ſchools of philoſophy, than that either of them borrowed it from the other. See METAPHYSICS, Part III. Chap. IV.

theſe times offered ſolemn prayers and ſacrifices for the proſperity of their country during the enſuing month. See Games.

The Jews had alſo their neomenia, or feaſt of the new moon, on which peculiar ſacrifices were appointed: and on this day they had a ſort of family entertainment and rejoicing. The moſt celebrated neomenia of all others was that at the beginning of the civil year, or firſt day of the month Tiſri, on which no ſervile labour was performed: they then offered particular burnt ſacrifices, and ſounded the trumpets of the temple. The modern Jews keep the neomenia only as a feaſt of devotion, which any one may obſerve or not as he pleaſes.

NEOPHYTES, "new plants;" a name given by the ancient Chriſtians to thoſe heathens who had newly embraced the faith; ſuch perſons being conſidered as regenerated, or born anew by baptiſm. The term *neophytes* has been alſo uſed for new prieſts, or thoſe juſt admitted into orders, and ſometimes for the novices in monaſteries. It is ſtill applied to the converts made by the miſſionaries among the infidels.

NEPA, in zoology, a genus of inſects belonging to the order of hemiptera. The roſtrum is inflected; the antennæ are ſhorter than the thorax; and the hind feet are hairy, and fitted for ſwimming. There are ſeven ſpecies. The four wings are folded together croſſwiſe, with the anterior part coriaceous. The two fore feet are cheliform, or reſemble the claws of a crab; the other four are formed for walking. We have but three ſpecies of this genus, all three of which are found in the water, where they dwell, as do their larvæ and chryſalids. It is likewiſe in the water that we find the eggs of the water ſcorpion. Thoſe eggs, of an oblong ſhape, have at one of their extremities two or more briſtles or hairs. The inſect ſinks its egg into the ſtalk of a bullruſh or ſome other water plant, ſo that the egg lies concealed, and only the hairs or briſtles ſtick out, and are to be ſeen. One may eaſily preſerve in water thoſe ſtalks loaded with eggs, and ſee the young water ſcorpions hatched under one's own roof, or at leaſt their larvæ. Theſe inſects are voracious, and feed on other aquatic animals, which they pierce and tear with their ſharp roſtrum, while they hold them with the forceps of their fore feet.—They fly well, eſpecially in the evening and night, and they convey themſelves from one pool to another, eſpecially when that they are in begins to dry up. Mr Geoffroy aſſerts, that the pedes cheliformes, or fore feet of the nepa, are the antennæ of the inſect, which, according to him, has but four feet.

NEPENTHES, in botany: A genus of the tetrandria order, belonging to the gynandria claſs of plants; and in the natural method ranking among thoſe of which the order is doubtful. The calyx is quadripartite; there is no corolla; the capſule is quadrilocular.

NEPETA, Catmint, or *Nep*, in botany: A genus of the gymnoſpermia order, belonging to the didynamia claſs of plants; and in the natural method ranking under the 42d order, *Verticillatæ*. The under lip of the corolla has a ſmall middle ſegment crenated; the margin of the throat is reflexed; the ſtamina approach one another. There are 14 ſpecies; the moſt remarkable is the cataria, common nep, or catmint. This is a native of many parts of Britain, growing about hedges and in waſte places. The ſtalk is a yard high, and branched; the leaves are hoary; the flowers fleſh coloured, growing verticillate in ſpikes at the tops of the branches: the middle ſegment of the lower lip is ſpotted with red. The plant has a bitter taſte, and ſtrong ſmell, not unlike pennyroyal. An infuſion of this plant is reckoned a good cephalic and emmenagogue; being found very efficacious in chlorotic caſes. Two ounces of the expreſſed juice may be given for a doſe. It is called *catmint*, becauſe cats are very fond of it, eſpecially when it is withered; for then they will roll themſelves on it, and tear it to pieces, chewing it in their mouths with great pleaſure. Mr Ray mentions his having tranſplanted ſome of the plants of this ſort from the fields into his garden, which were ſoon deſtroyed by the cats; but the plants which came up from ſeeds in his garden eſcaped: this verifies an old proverb, *viz.* "If you ſet it, the cats will eat it; if you ſow it, the cats will not know it." Mr Withering is of opinion, that where there is a quantity of plants growing together, the cats will not meddle with them; but Mr Millar aſſures us, that he has frequently tranſplanted one of theſe plants from another part of the garden, within two feet of which ſome came up from ſeeds; in which caſe the latter have remained unhurt, when the former have been torn to pieces and deſtroyed: he acknowledges, however, that, where there is a large quantity of the herb growing together, they will not meddle with it. This plant is very hardy, and is eaſily propagated by ſeeds. If ſown upon a poor dry ſoil, the plants will not grow too rank, but will continue longer, and appear much handſomer, than in rich ground, where they grow too luxuriant, and have not ſo ſtrong a ſcent.

NEPHELIUM, in botany: A genus of the pentandria order, belonging to the monœcia claſs of plants. The male calyx is quinquidentate; there is no corolla: the female calyx is quadrifid; there is no corolla.—There are two germens and two ſtyles on each: the fruit are two dry plumbs, muricated, and monoſpermous.

NEPHEW, a term relative to uncle and aunt, ſignifying a brother's or ſiſter's ſon; who, according to the civil law, is in the third degree of conſanguinity, but according to the canon in the ſecond.

NEPHRITIC, ſomething that relates to the kidneys. See Kidney.

Nephritic Wood, (lignum nephriticum), a wood of a very denſe and compact texture, and of a fine grain, brought to us from New Spain in ſmall blocks, in its natural ſtate, and covered with its bark. It is to be choſen of a pale colour, ſound and firm, and ſuch as has not loſt its acrid taſte: for the ſureſt teſt of it is the infuſing it in water; for a piece of it infuſed only half an hour in cold water, gives it a changeable colour, which is blue or yellow as variouſly held to the light. If the vial it is in be held between the eye and the light, the tincture appears yellow; but if the eye be placed between the light and the vial, it appears blue. We often meet with this wood adulterated with others of the ſame pale colour; but the duſkiſh black hue of the bark is a ſtriking character of this.

The tree is the *coatli* of Hernandez. It grows to the height of our pear tree, and its wood while freſh is much of the ſame texture and colour; the leaves are ſmall and oblong, not exceeding half an inch in length, or a third of an inch in breadth: the flowers are ſmall, of a pale yellow colour, and oblong ſhape, ſtanding in ſpikes: the cups they ſtand in are divided into five ſegments at the edge, and are covered with a reddiſh down. This is the beſt deſcription of the tree that can be collected from what has been hitherto written of it; nobody having yet had an opportunity of taking its true characters.

This wood is ſaid to be a very good diuretic; and we are told it is uſed among the Indians is all diſeaſes of the kidneys and bladder, and in ſuppreſſion of urine, from whatever cauſe. It is alſo recommended in fevers, and in obſtructions of the viſcera. The way of taking it among the Indians is only an infuſion in cold water. Theſe uſes are not however properly aſcertained. See Guilandina.

Nephritic Stone. See *Jade Stone.*

NEPHRITICS, in pharmacy, medicines proper for diſeaſes of the kidneys, eſpecially the ſtone.—Such particularly are the roots of althæa, dog's graſs, aſparagus, ſago, pellitory of the wall, mallows, pimpinella, red chick peaſe, peach kernels, turpentine, &c.

NEPHRITIS, or inflammation of the kidneys. See Medicine, N° 200.

NEPOS (Cornelius), a celebrated Latin biographer, who flouriſhed in the time of Julius Cæſar, and lived, according to St Jerome, to the ſixth year of Auguſtus. He was an Italian, if we may credit Catullus, and born at Hoſtilia, a ſmall town in the territory of Verona, in Ciſalpine Gaul. Auſonius, however, will have it that he was born in the Gauls: and in that they may both be in the right, provided that under the name of *Gaul* is comprehended *Gallia Ciſalpina*, which is in Italy. Leander Alberti thinks Nepos's country was Verona; and he is ſure that he was either born in that city or neighbourhood. For the reſt, Cicero and Atticus were friends of our author; who wrote the lives of the Greek hiſtorians, as he himſelf atteſts in that of Dion, ſpeaking of Philiſtus. What he ſays, alſo, in the lives of Cato and Hannibal, proves that he had alſo written the lives of the Latin captains and hiſtorians. He wrote ſome other excellent works which are loſt.

All that we have left of his at preſent is, "The Lives of the illuſtrious Greek and Roman Captains;" which were a long time aſcribed to Æmilius Probus, who publiſhed them, as it is ſaid, under his own name, to inſinuate himſelf thereby into the favour of the emperor Theodoſius; but, in the courſe of time, the fraud has been diſcovered, although ſeveral learned perſons have confounded the two authors. This piece has been tranſlated into French by the Sieur de Claveret, with a dedication to the duke of Longueville, in 1663; and again by M. le Gras, then of the congregation of the Oratory at Paris 1729, 12mo. We have an excellent tranſlation of it into Engliſh, by ſeveral hands at Oxford, which has gone through ſeveral editions.

NEPTUNE, in Pagan worſhip, the god of the ſea, was the ſon of Saturn and Veſta or Ops, and the brother of Jupiter and Pluto. He aſſiſted Jupiter in his expeditions; on which that god, when he arrived at the ſupreme power, aſſigned him the ſea and the iſlands for his empire. He was, however, expelled from heaven with Apollo for conſpiring againſt Jupiter, when they were both employed by Laomedon king of Phrygia in building the walls of Troy; but that prince diſmiſſing Neptune without a reward, he ſent a ſea monſter to lay waſte the country, on which he was obliged to expoſe his daughter Heſione. He is ſaid to have been the firſt inventor of horſemanſhip and chariot racing; on which account Mithridates king of Pontus threw chariots drawn by four horſes into the ſea in honour of this god; and the Romans inſtituted horſe races in the circus at his feſtival, during which all other horſes left working, and the mules were adorned with wreaths of flowers.

In a conteſt with Minerva he produced a horſe by ſtriking the earth with his trident; and on another occaſion, in a trial of ſkill with Minerva and Vulcan, produced a bull, whence that animal was ſacrificed to him. His favourite wife was Amphytrite, whom he long courted in vain, till ſending a dolphin to intercede for him, he met with ſucceſs; on which he rewarded the dolphin by placing him among the ſtars. He had alſo two other wives, one of whom was called *Salaſia* from the ſalt water; the other *Venilia* from the ebbing and flowing of the tides. He had likewiſe many concubines, by whom he had a great number of children. He is repreſented with black hair, with a garment of an azure or ſea green, holding his trident in his hand, and ſeated in a large ſhell drawn by ſea horſes, attended by the ſea gods Palemon, Glaucus, and Phorcys, and the ſea goddeſſes Thetis, Melita, and Panopæa, and a long train of tritons and ſea nymphs.

This deity was in Egypt known by the name of *Canobus* or *Canopus*, and was worſhipped as the *numen aquarum* or ſpirit of the Nile. His emblem was the figure of certain vaſes or pitchers, with which the Egyptians filtrated the water of their ſacred river, in order to purify and render it fit for uſe. From the mouth of each of theſe vaſes, which were charged with hieroglyphics, aroſe the head, and ſometimes the head and hands, of a man or woman. Such are the emblems which ſtill remain of the Egyptian Neptune or Canobus; and it was by this emblem that the tutelar god of Egypt vanquiſhed the god of Chaldea in the ridiculous manner mentioned by Ruffinus in his eccleſiaſtical hiſtory †.

"The Chaldæans (ſays he) who adored the fire, carried their god into various countries that he might try his ſtrength in conteſts with other gods. He vanquiſhed, as we may eaſily conceive, the images made of gold, ſilver, braſs, and wood, &c. by reducing them to aſhes; and thus the worſhip of fire was everywhere eſtabliſhed. The prieſt of Canobus, unwilling, as became him, to admit the ſuperiority of ſtrange gods, contrived to make his god vanquiſh the [illegible] of Chaldæa in a pitched battle. The vaſes which were worſhipped as the emblems of Canobus being uſed for filtering the waters of the Nile, were of courſe perforated on all ſides with very ſmall holes. This faithful prieſt having ſtopped all the holes in one of theſe with wax, and painted the vaſe of different colours for a reaſon which the reader will admit to be a good one, filled it up with water, and fitted to its mouth the head of an idol. This emblem of Canobus was then placed in a ſmall fire brought by the Chaldeans,

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Chaldæans as the emblem of their god; and thus the gods of Egypt and Chaldæa were forced into battle. The conteſt, however, was of ſhort duration. The heat melting the wax made way for the water to run out, which quickly extinguiſhed the fire; and thus Canôbus vanquiſhed the god of the Chaldæans." Ridiculous as this ſtory is, it is perfectly ſuitable to the genius of Paganiſm, and the mean artifices of the Pagan prieſthood; but we ſuſpect that the hiſtorian laboured under one miſtake, and ſubſtituted the Chaldæans inſtead of the Perſians. See POLYTHEISM.

NEREIDS, in the Pagan theology, ſea nymphs, daughters of Nereus and Doris.—The Nereids were eſteemed very handſome; inſomuch that Caſſiope, the wife of Cepheus king of Ethiopia, having triumphed over all the beauties of the age, and daring to vie with the Nereids, they were ſo enraged that they ſent a prodigious ſea monſter into the country; and, to appeaſe them, ſhe was commanded by the oracle to expoſe her daughter Andromeda, bound to a rock, to be devoured by the monſter. In ancient monuments, the Nereids are repreſented riding upon ſea horſes; ſometimes with an entire human form, and at other times with the tail of a fiſh.

NEREIS, in zoology, a genus of animals belonging to the order of vermes mollusca. The body is oblong, linear, and fitted for creeping; it is furniſhed with lateral pencilled tentacula. There are 11 ſpecies; of which the moſt remarkable are the five following:

Plat CCCXLV. fig. 1. 1. The *noctiluca*, or noctilucous nereis, which inhabits almoſt every ſea, and is one of the cauſes of the luminouſneſs of the water. Theſe creatures ſhine like glow-worms, but with a brighter ſplendour, ſo as at night to make the element appear as if on fire all around. Their bodies are ſo minute as to elude examination by the naked eye.

It is ſometimes called *nereis phoſphorans;* and is thus deſcribed by Griſelin: The head is roundiſh and flat, and the mouth acuminated. The two horns or feelers are ſhort and ſubulated. The eyes are prominent, and placed on each ſide the head. The body is compoſed of about 23 ſegments or joints, which are much leſs near the tail than at the head. Theſe ſegments on both ſides the animal all end in a ſhort conical apex, out of which proceeds a little bundle of hairs: from under theſe bundles the feet grow in the form of ſmall flexile ſubulated figments deſtitute of any thing like claws. It is ſcarcely two lines long, and is quite pellucid, and its colour is that of water green. They are found upon all kinds of marine plants; but they often leave them, and are found upon the ſurface of the water; they are frequent at all ſeaſons, but eſpecially in ſummer before ſtormy weather, when they are more agitated and more luminous. Their numbers, and wonderful agility, added to their pellucid and ſhining quality, do not a little contribute to their illuminating the ſea, for myriads of thoſe animalculæ may be contained in the portion of a ſmall cup of ſea water. Innumerable quantities of them lodge in the cavities of the ſcales of fiſhes, and to them probably do the fiſhes owe their noctilucous quality. "I have obſerved with great attention (ſays Barbut), a fiſh juſt caught out of the ſea, whoſe body was almoſt covered with them; and have examined them in the dark: they twiſt and curl themſelves with amazing agility, but ſoon retire out of our contracted ſight; probably their glittering numbers dazzling the eye, and their extreme minuteneſs eluding our reſearches. It is to be obſerved, that when the unctuous moiſture which covers the ſcales of fiſhes is exhauſted by the air, theſe animals are not to be ſeen; nor are the fiſhes then noctilucous, that matter being perhaps their nouriſhment when living, as they themſelves afford food to many marine animals. They do not ſhine in the day time, becauſe the ſolar rays are too powerful for their light, however aggregate or immenſe their number." Their appearance is particularly brilliant when the wind is in the eaſt and ſouth-eaſt points, and in winter nights preceded by a warm day. If water containing theſe animalcules be kept warm, they retain their light two whole days after they are dead; but in cold water loſe it in eight hours: motion and warmth, which increaſe their vivacity and ſtrength, increaſe their light alſo.

2. *Nereis lacuſtris*, or bog nereis. Fig. 2. The body of the ſize of a hog's ſhort briſtle, tranſparent, as it were articulated, and on either ſide at every articulation provided with a ſhort ſetaceous foot; interiorly it ſeems to conſiſt in a manner of oval-ſhaped articulations, and a back formed by two lines bent backwards. It inhabits marſhes abounding in clay, where it remains under ground, puſhing out its other extremity by reaſon of its continual motion. When taken out it twiſts itſelf up. Is frequent in Sweden.

3. *Nereis cirroſa*, or waving nereis. Fig. 3. The body is red, lumbriciform, with 65 notches, furniſhed on both ſides with two rows of briſtles. At each ſide of the head ten filaments, at the ſides of the mouth many, twice as long as the former. It dwells in Norway, on rocks at the bottom of the ſea. It vomits a red liquor with which it tinges the water.

4. *Nereis cærulea*, or blue nereis. Fig. 4. It inhabits the ocean; where it deſtroys the ſerpulæ and teredines.

5. *Nereis gigantæa*, or giant nereis. Fig. 5. This is a peculiar ſpecies of thoſe large worms that make their way into decayed piles driven down into the ſea, which they bore through and feed upon, whence they are called *ſea worms* or nereis. From head to tail they are beſet on either ſide with ſmall tufts terminating in three points; which are like the fine hair pencils uſed by painters, and compoſed of ſhining briſtles of various colours. The upper part of the body in this worm is all over covered with ſmall hairs. The rings of which it is formed are cloſely preſſed together, and yield to the touch. The three rows of ſmall tufts we have been deſcribing, ſerve this nereis inſtead of feet, which it uſes to go forwards as fiſhes do their fins.

NEREUS, (fab. hiſt.), a marine deity, was the ſon of Oceanus and Thetis. He ſettled in the Ægean ſea, was conſidered as a prophet, and had the power of aſſuming what form he pleaſed. He married his ſiſter Doris, by whom he had 50 daughters called the *Nereids*, who conſtantly attended on Neptune, and when he went abroad ſurrounded his chariot.

NERI (S. Philippe de), founder of the congregation of the Oratory in Italy, was born of a noble family at Florence, on the 25th of July 1515. Educated in the principles of piety and learning, he ſoon became

Neri

Nero.

became diſtinguiſhed for his knowledge and virtue. At the age of 19 he went to Rome, where he improved his mind, aſſiſted the ſick, and gave many proofs of ſelf-denial and humility. Philippe, being raiſed to the prieſthood at the age of 36, inſtituted, in 1550, a celebrated fellowſhip in the church of St Saviour del Campo, for the relief of poor foreigners, of pilgrims, and of convaleſcents, who had no place whither they could retire. This ſociety was the cradle, if we may ſay ſo, of the congregation of the Oratory. The holy founder having gained over to God Salviati brother to the cardinal of the ſame name, Tarugio afterwards cardinal, the celebrated Baronius, and ſeveral others, they began to form themſelves into a ſociety in 1564. The ſpiritual exerciſes had been transferred in 1558 to the church of Saint Jerome de la Charité, which Philippe did not leave till 1574, when he went to ſtay at Saint John of the Florentines. Pope Gregory XIII. gave his approbation of the congregation in the following year. The father of this new warfare ſent out ſome of his children, by whom his order was ſpread thoughout Italy. Nor is there any reaſon to be ſurpriſed at its rapid ſucceſs. No vow is taken in this congregation; charity is the only bond of connexion. The general continues only three years in office, and his orders are not thoſe of a tyrant or a deſpot. The founder died at Rome on the night between the 25th and 26th of May 1595, aged 80. He had reſigned the generalſhip three years before in favour of Baronius, who, by his advice, was engaged in the eccleſiaſtical annals. The conſtitutions which he left for his congregation were not printed till 1612. The principal employment which he allots to the prieſts of his order, is to give, every day, in their oratory or church, inſtructions ſuited to the underſtandings of their hearers: an office truly apoſtolical, and which the followers of Neri diſcharge with ſucceſs. They humble themſelves, that they may exalt to God the ſoul of the ſimple. Philippe was canonized in 1622 by Gregory XV.

There was a learned man of the name of Neri (Anthony), from whom we have a curious book printed at Florence 1612, in 4to, with this title *Dell' Arte verraria Libri VII.*; and a Dominican named *Thomas Neri*, who employed his pen in defence of his fellow monk, the famous Savonarole.

NERIUM, in botany: A genus of the monogynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 30th order, *Contortæ*. There are two erect follicles; the ſeeds plumy; the tube of the corolla terminated by a lacerated crown. There are five ſpecies, all of them natives of the warmer climates: the moſt remarkable of which are, 1. The oleander, South ſea roſe: this is a beautiful ſhrub, cultivated in gardens on account of its flowers, which are of a fine purple, and in cluſters, but of an indifferent ſmell: the whole plant is poiſonous, and eſpecially the bark of the roots. 2. The antidyſintericum, a native of Ceylon: the bark of which is an article of materia medica, under the name of *Coneſſi*. 3. The tinctorium, a new ſpecies with beautiful blue flowers lately diſcovered by Dr Roxburgh at Madras. A decoction of the leaves, with an addition of lime water, makes an indigo of fine quality.

Nero.

NERO (Claudius Domitius Cæſar), a celebrated Roman emperor, ſon of Caius Domitius Ahenobarbus and Agrippina the daughter of Germanicus. He was adopted by the emperor Claudius, A. D. 50, and four years after he ſucceeded to him on the throne. In the beginning of his reign he ſhowed ſeveral marks of the greateſt kindneſs and condeſcenſion, affability, complaiſance, and popularity. The object of his adminiſtration ſeemed to be the good of his people; and when he was deſired to ſign his name to a liſt of malefactors that were to be executed, he exclaimed, *Would to heaven I could not write!* He hated flattery; and when the ſenate had liberally commended the wiſdom of his government, he deſired them to keep their praiſes till he deſerved them. Theſe promiſing virtues ſoon, however, proved to be artificial: Nero ſoon diſplayed the real propenſities of his nature. He delivered himſelf from the ſway of his mother, and at laſt ordered her to be murdered. This unnatural act of barbarity might aſtoniſh ſome, but Nero had his devoted adherents; and when he declared that he had taken away his mother's life to ſave himſelf from ruin, the ſenate applauded his meaſures, and the people ſignified their approbation. Many of his courtiers ſhared her unhappy fate; and Nero ſacrificed to his fury or caprice all ſuch as obſtructed his pleaſure or diverted his inclination. In the night he generally went from his palace to viſit the meaneſt taverns, and all the ſcenes of debauchery which Rome contained. In this nocturnal riot he was fond of inſulting the people in the ſtreets; and his attempts to offer violence to the wife of a Roman ſenator nearly coſt him his life. He alſo turned actor, and openly appeared on the Roman ſtage in the meaneſt characters. In his attempts to excel in muſic, and to conquer the diſadvantages of a hoarſe diſagreeable voice, he moderated his meals, and often paſſed the day without eating. The Olympian games attracted his notice: he went into Greece, and preſented himſelf a candidate for the public honour. He was defeated in wreſtling; but the flattery of the ſpectators adjudged him the victory, and he returned to Rome with all the pomp and ſplendour of an eaſtern conqueror, drawn in the chariot of Auguſtus, and attended by a band of muſicians, actors, and ſtage-dancers from every part of the empire. Theſe private and public amuſements of the emperor were indeed innocent; his character only was injured, and not the lives of the people. His conduct, however, ſoon became more abominable: he diſguiſed himſelf in the habit of a woman, and was publicly married to one of his eunuchs. This violence to nature and decency was ſoon exchanged for another: Nero reſumed his ſex, and celebrated his nuptials with one of his meaneſt catamites: and it was on this occaſion that one of the Romans obſerved that the world would have been happy if Nero's father had had ſuch a wife. But his cruelty was now diſplayed in a ſtill higher degree, for he ſacrificed to his wantonneſs his wife Octavia Poppæa, and the celebrated writers, Seneca, Lucan, Petronius, &c. Nor did the Chriſtians eſcape his barbarity. He had heard of the burning of Troy; and as he wiſhed to renew that diſmal ſcene, he cauſed Rome to be ſet on fire in different places. The conflagration became ſoon univerſal, and during nine ſucceſſive days the fire continued. All was deſolation: nothing was heard but the lamentations of mothers whoſe children had periſhed in the flames, the groans of the dying, and the continual fall of palaces and buildings. Nero was the only one who enjoyed the general conſternation. He placed himſelf on the top of a high tower, and he ſung on his lyre the deſtruction of Troy, a dreadful ſcene which his barbarity had realized before his eyes. He attempted to avert the public odium from his head by a pretended commiſeration of the miſeries of his ſubjects. He began to repair the ſtreets and the public buildings at his own expence. He built himſelf a celebrated palace, which he called his golden houſe. It was liberally adorned with gold, with precious ſtones, and with every thing rare and exquiſite. It contained ſpacious fields, artificial lakes, woods, gardens, orchards, and whatever exhibited a beautiful ſcene. The entrance of this edifice could admit a large coloſſus of the emperor 120 feet high; the galleries were each a mile long, and the whole was covered with gold. The roofs of the dining halls repreſented the firmament, in motion as well as in figure; and continually turned round night and day, ſhowering down all ſorts of perfumes and ſweet waters. When this grand edifice, which, according to Pliny, extended all round the city, was finiſhed, Nero ſaid, that now he could lodge like a man. His profuſion was not leſs remarkable in all his other actions. When he went a fiſhing, his nets were of gold and ſilk. He never appeared twice in the ſame garment; and when he took a voyage, there were thouſands of ſervants to take care of his wardrobe. This continuation of debauchery and extravagance at laſt rouſed the people. Many conſpiracies were formed againſt him; but they were generally diſcovered, and ſuch as were acceſſory ſuffered the ſevereſt puniſhments. The moſt dangerous conſpiracy againſt Nero's life was that of Piſo, from which he was ſaved by the confeſſion of a ſlave. The conſpiracy of Galba proved more ſucceſsful, who, when he was informed that his plot was known to Nero, declared himſelf emperor. The unpopularity of Nero favoured his cauſe; he was acknowledged by all the Roman empire, and the ſenate condemned the tyrant to be dragged naked through the ſtreets of Rome, and whipped to death, and afterwards to be thrown down from the Tarpeian rock like the meaneſt malefactor. This, however, was not executed; for Nero prevented it by a voluntary death. He killed himſelf, A. D. 68, in the 32d year of his age, after a reign of 13 years and eight months. Rome was filled with acclamations at it; and the citizens, more ſtrongly to indicate their joy, wore caps, ſuch as were generally uſed by ſlaves who had received their freedom. Their vengeance was not only exerciſed againſt the ſtatues of the deceaſed monſter, but many of his friends were the object of the public reſentment; and many were cruſhed to pieces in ſuch a violent manner, that one of the ſenators, amid the univerſal joy, ſaid that he was afraid they ſhould ſoon have cauſe to wiſh for Nero. The tyrant, as he expired, requeſted that his head might not be cut off from his body, and expoſed to the inſolence of the populace, but that the whole might be burned on the funeral pile. His requeſt was granted by one of Galba's freedmen, and his obſequies were performed with the uſual ceremonies. Though his death ſeemed to be the ſource of general gladneſs, yet many of his favourites lamented his fall, and were grieved to ſee that their pleaſures and amuſements were ſtopped by the death of this patron of debauchery and extravagance. Even the king of Parthia ſent ambaſſadors to Rome, to condole with the Romans, and to beg that they would honour and revere the memory of Nero. His ſtatues were alſo crowned with garlands of flowers; and many imagined that he was not dead, but that he would ſoon make his appearance and take vengeance on his enemies. It will be ſufficient to obſerve, in finiſhing the character of this tyrannical monſter, that the name of *Nero* is even now uſed emphatically to expreſs a barbarous and unfeeling oppreſſor. Pliny calls him the common enemy and fury of mankind; and ſo indeed he has been called by all writers, who exhibit Nero as a pattern of the moſt execrable barbarity and unpardonable wantonneſs. The ſame Pliny furniſhes us with this ſingular anecdote of him: "Nero had ordered himſelf to be painted under the figure of a coloſſus, upon cloth or canvas, 120 feet in height." He adds, "that this prepoſterous picture, when it was finiſhed, met with its fate from lightning, which conſumed it, and involved likewiſe the moſt beautiful part of the gardens where it was placed in the conflagration."

NERVA (Cocceius), a Roman emperor after Domitian, who was the laſt of the 12 Cæſars. He was a native of Narnia in Umbria; his family however was originally of Crete. Dion Caſſius ſays he was born on the 17th of March, in the 18th year of Tiberius's reign, and of the Chriſtian era the 32d. Nero in the 12th year of his reign made him prætor, and erected a ſtatue for him in the palace on account of his poems (for he was one of the beſt poets of his age), ſome of which were inſcribed to him. He was conſul in 71 with Veſpaſian, and in 90 with Domitian.

Ancient authors uniformly celebrate him as a prince of a moſt mild and humane temper, of great moderation and generoſity, who looked on his office as emperor, not as if it was for his own advantage, but for that of his people; and whilſt he reigned, which was however but for a ſhort time, he made the happineſs of his ſubjects his only end and purſuit. He narrowly eſcaped death under Domitian; was naturally of a weak and timorous diſpoſition; and, as ſome ſay, addicted to exceſſive drinking. The Romans unanimouſly choſe him emperor; and they had no cauſe to repent of their choice, for he was conſtantly attentive to what could make them happy; he was generous, merciful, and diſintereſted. An inſtance of his great lenity appears in his pardoning Calpurnius Craſſus who conſpired againſt him. In ſhort, he omitted nothing that might contribute to the reſtoring of the empire to its former luſtre: recalling thoſe who had been baniſhed for religion, and redreſſing all grievances that came to his knowledge. He however found his ſtrength failing, and that it would be impoſſible for him to finiſh his deſigns, in conſequence of which he adopted Trajan. After his death, which happened in the year 98, he was ranked among the gods. He was the firſt Roman emperor of foreign extraction.

NERVES, in anatomy, certain white gliſtening cords, proceeding from the brain and ſpinal marrow, and dividing into very ſmall branches, which are ſent off throughout all parts of the body; and which are

Nervous ‖ Neſtor.

found to be the organs of ſenſation and motion. See Anatomy, N° 136.

NERVOUS fluid. See Anatomy, N° 136.

NESSUS (fab. hiſt.), a celebrated Centaur, ſon of Ixion and a Cloud. He offered violence to Dejanira whom Hercules had entruſted to his care, with orders to carry her acroſs the river Evenus. Hercules ſaw the diſtreſs of his wife from the oppoſite ſhore of the river, and immediately he let fly one of his poiſoned arrows, which ſtruck the Centaur to the heart. Neſſus, as he expired, gave the tunic he then wore to Dejanira, aſſuring her that from the poiſoned blood which had flowed from his wounds, it had received the power of calling a huſband away from unlawful loves. Dejanira received it with pleaſure, and this mournful preſent cauſed the death of Hercules.——A river which ſeparates Thrace from Macedonia. It is alſo called *Neſus*, *Neſtos*, and *Neſtus*.

NEST. See Nidus.

Eatable Birds Nests. See *Birds Neſts*.

NESTOR (fab. hiſt.), a ſon of Neleus and Chloris, nephew to Pelias and grandſon to Neptune. He had eleven brothers, who were all killed with his father by Hercules. His tender age detained him at home, and was the cauſe of his preſervation. The conqueror ſpared his life and placed him upon the throne of Pylos. He married Eurydice the daughter of Clymenus; or, according to others, Anaxibia the daughter of Atreus. He ſoon diſtinguiſhed himſelf in the field of battle; and was preſent at the nuptials of Perithous, when a bloody engagement took place between the Lapithæ and Centaurs. As king of Pylos and Meſſenia he led his ſubjects to the Trojan war, where he diſtinguiſhed himſelf among the reſt of the Grecian chiefs, by eloquence, addreſs, wiſdom, juſtice, and uncommon prudence. Homer diſplays his character as the moſt perfect of all his heroes; and Agamemnon exclaims, that if he had 20 generals like Neſtor, he ſhould ſoon ſee the walls of Troy reduced to aſhes. After the Trojan war Neſtor retired to Greece, where he enjoyed in the boſom of his family the peace and tranquillity which were due to his wiſdom and to his age. The manner and the time of his death are unknown: the ancients are all agreed that he lived three generations of men; which length of time is ſuppoſed to be 300 years, though more probably only 90 years, allowing 30 years for each generation. From that circumſtance, therefore, it was uſual among the Greeks and the Latins, when they wiſhed a long and happy life to their friends, to wiſh them to ſee the years of Neſtor. He had many children; two daughters, Piſidice and Polycaſte; and ſeven ſons, Perſeus, Stratichus, Aretus, Echephron, Piſiſtratus, Antilochus, and Thraſymedes. Neſtor was one of the Argonauts, according to Valerius Flaccus, v. 380, &c.—A poet of Lycaonia in the age of the emperor Severus. He was father to Piſander, who under the emperor Alexander wrote ſome fabulous ſtories——One of the body guards of Alexander.

Nestor, whoſe ſecular name is not known, was a native of Ruſſia, and the earlieſt hiſtorian of the north. He was born in 1056 at Bielozero; and in the 19th year of his age he aſſumed the monaſtic habit in the convent of Petcherſki at Kiof, and took the name of *Neſtor*. He there made a conſiderable proficiency in the Greek [illegible]: but ſeems to have formed his ſtyle and [illegible]nner [illegible]ther from the Byzantine hiſtorians, Cedrenus, [illegible]onar[illegible] and Syncellus, than from the ancient claſſi[illegible] [illegible] time of Neſtor's death is not aſcertained; b[illegible] he [illegible] ſuppoſed to have lived to an advanced age, [illegible] [illegible]ve died about the year 1115.

Neſtor, Neſtorians.

His g[illegible] [illegible] is his Chronicle, to which he has prefixed an introduction, which after a ſhort ſketch of the early ſtate of the world, taken from the Byzantine writers, contains a geographical deſcription of Ruſſia and the adjacent regions; an account of the Sclavonian nations, their manners, their emigrations from the banks of the Danube, their diſperſion, and ſettlements in the ſeveral countries wherein their deſcendants are now eſtabliſhed. He then enters upon a chronological ſeries of the Ruſſian annals, from the year 8[illegible] to about 1113. His ſtyle is ſimple and unadorned, ſuch as ſuits a mere recorder of facts; but his chronological exactneſs, though it renders his narrative d[illegible] and tedious, contributes to aſcertain the era and authenticity of the events which he relates.

It is remarkable (ſays Mr Coxe, from whom we have taken this narrative), that an author of ſuch importance, whoſe name frequently occurs in the early Ruſſian books, ſhould have remained in obſcurity above 600 years; and been ſcarcely known to his modern countrymen, the origin and actions of whoſe anceſtors he records with ſuch circumſtantial exactneſs. A copy of his Chronicle was given in 1668 by Prince Ra[illegible]ivil to the library of Konigſburg, where it lay unnoticed till Peter the Great in his paſſage through the town, ordered a tranſcript of it to be ſent to Peterſburgh. But it ſtill was not known as the performance of Neſtor: for when Muller in 1732 publiſhed the firſt part of a German tranſlation, he mentioned it as the work of the abbot Theodoſius of Kiof; an error which aroſe from the following circumſtance: The ingenious editor not being at that time ſufficiently acquainted with the Sclavonian tongue, employed an interpreter, who, by miſtaking a letter in the title, ſuppoſed it to have been written by a perſon whoſe name was Theodoſius. This ridiculous blunder was ſoon circulated, and copied by many foreign writers, even long after it had been candidly acknowledged and corrected by Muller.

NESTORIANS, a ſect of ancient Chriſtians, ſtill ſaid to be ſubſiſting in ſome parts of the Levant; whoſe diſtinguiſhing tenet is, that Mary is not the mother of God. They take their name from Neſtorius biſhop of Conſtantinople, whoſe doctrines were ſpread with much zeal through Syria, Egypt, and Perſia.

One of the chief promoters of the Neſtorian cauſe was Barſumas, created biſhop of Niſibis, A. D. 435. Such was his zeal and ſucceſs, that the Neſtorians, who ſtill remain in Chaldea, Perſia, Aſſyria, and the adjacent countries, conſider him alone as their parent and founder. By him Pherozes the Perſian monarch was perſuaded to expel thoſe Chriſtians who adopted the opinions of the Greeks, and to admit the Neſtorians in their place, putting them in poſſeſſion of the principal ſeat of eccleſiaſtical authority in Perſia, the ſee of Seleucia, which the patriarch of the Neſtorians has always filled even down to our time.—Barſumas alſo erected a ſchool at Niſibis, from which

Neſtorians.

proceeded thoſe Neſtorian doctors in the fifth and ſixth centuries ſpread abroad the tenets through Egypt, Syria, Arabia, India, Tartar and China.

He differed conſiderably from [illegible], holding that there are two perſons in Jeſus Criſt, as well as that the Virgin was not his mother, as [illegible], but only as man.

The abettors of this doctrine refuſe the title Neſtorians; alleging that it had been handed down from the earlieſt times of the Chriſtian church.

In the tenth century, the Neſtorians in Chaldea, whence they are ſometimes called *Chaldeans*, extended their ſpiritual conqueſts beyond Mount Imaus, and introduced the Chriſtian religion into Tartary properly ſo called, and eſpecially into that country called *Karit*, bordering on the northern part of China. The prince of that country, whom the Neſtorians converted to the Chriſtian faith, aſſumed, according to the vulgar tradition, the name of *John* after his baptiſm, to which he added the ſurname of *Preſbyter*, from a principle of modeſty; whence it is ſaid his ſucceſſors were each of them called *Preſter John* until the time of Gengis Khan. But Moſheim obſerves, that the famous Preſter John did not begin to reign in that part of Aſia before the concluſion of the 11th century. The Neſtorians formed ſo conſiderable a body of Chriſtians, that the miſſionaries of Rome were induſtrious in their endeavours to reduce them under the papal yoke. ent IV. in 1246 and Nicolas IV. in 1278, ed their utmoſt efforts for this purpoſe, but without ceſs. Till the time of Pope Julius III. the Neſtorians acknowledged but one patriarch, who reſided at Bagdad, and afterwards at Mouſul; but a diviſion ariſing among them, in 1551 the patriarchate became divided, at leaſt for a time, and a new patriarch was onſecrated by that pope whoſe ſucceſſors fixed their reſidence in the city of Ormus in the mountainous part of Perſia, where they ſtill continue, diſtinguiſhed by the name of *Simeon*; and ſo far down as the laſt century, theſe patriarchs perſevered in their communion with the church of Rome, but ſeem at preſent to have withdrawn themſelves from it. The great Neſtorian pontiffs, who form the oppoſite party, and look with a hoſtile eye on this little patriarch, have ſince the year 1559 been diſtinguiſhed by the general denomination of Elias, and reſide conſtantly in the city of Mouſul. Their ſpiritual dominion is very extenſive, takes in a great part of Aſia, and comprehends alſo within its circuit the Arabian Neſtorians, and alſo the Chriſtians of St Thomas, who dwell along the coaſt of Malabar. It is obſerved, to the laſting honour of the Neſtorians, that of all the Chriſtian ſocieties eſtabliſhed in the Eaſt, they have been the moſt careful and ſucceſsful in avoiding a multitude of ſuperſtitious opinions and practices that have infected the Greek and Latin churches. About the middle of the 17th century, the Romiſh miſſionaries gained over to their communion a ſmall number of Neſtorians, whom they formed into a congregation or church; the patriarchs or biſhops of which reſide in the city of Amida, or Diarbeker, and all aſſume the denomination of *Joſeph*. Nevertheleſs the Neſtorians in general perſevere to our own times in their refuſal to enter into the communion of the Romiſh church, notwithſtanding the earneſt entreaties and alluring offers that have been made by the pope's legate to conquer their inflexible conſtancy.

Neſtorius.

NESTORIUS, from whom the ſect of Neſtorian Chriſtians derive their name, was born in Germanica a city of Syria. He received his education at Antioch, where he was likewiſe baptized; and ſoon after his baptiſm he withdrew himſelf to a monaſtery in the ſuburbs of that city. Upon his being admitted to the order of prieſtood, he quickly acquired ſo great reputation by the eloquence of his preaching, and the regularity of his life, that by the emperor Theodoſius he was deemed a fit perſon to fill the ſecond ſee in the Chriſtian church, and was accordingly conſecrated biſhop of Conſtantiople in the year 429.

In one of his firſt ſermons after his promotion, he publicly declared his intention to *make war upon heretics*; and with that intolerant ſpirit which has ſo often diſgraced the preachers of the mild religion of Jeſus, he called upon the emperor to *free the earth from heretics*, promiſing to give him heaven as a reward for his zeal. To this ſpiritual motive he added one, that, though carnal, he poſſibly judged of equal force:—“Join with me (ſaid he) in war againſt them, and I will aſſiſt you againſt the Perſians.” Although the wiſer and better part of his audience were amazed to ſee a man, before he had taſted (as the hiſtorian * expreſſes himſelf) the water of his city, declare that he would perſecute all who were not of his opinion; yet the majority of the people approved of this diſcourſe, and encouraged him to execute his purpoſe. Accordingly, five days after his conſecration, he attempted to demoliſh the church in which the Arians ſecretly held their aſſemblies; and he ſucceeded ſo far in his deſign, that theſe people, growing deſperate, ſet it on fire themſelves, and conſumed with it ſome of the neighbouring houſes. This fire excited great commotions in the city, and Neſtorius was ever afterwards called *incendiary*.

From the Arians he turned his perſecution againſt the Novatians, but was ſtopped in his career by the interpoſition of the emperor. He then let looſe his fury thoſe Chriſtians of *Aſia*, *Lydia*, and *Caria*, who celebrated the feaſt of Eaſter upon the 14th day of the moon; and for this unimportant deviation from the Catholic practice, many of thoſe people were murdered by his agents both at Miletum and Sardis.—One cannot be ſorry that ſuch a relentleſs perſecutor ſhould himſelf be afterwards condemned as a heretic, for holding an opinion which no man who ſpeaks or thinks with philoſophic accuracy will now venture to controvert. This obnoxious tenet which produced a ſchiſm in the church, and was condemned by a general council, was nothing more than that “the Virgin Mary cannot with propriety be called the mother of God.” The people being accuſtomed to hear this expreſſion, were much inflamed againſt their biſhop, imagining that he had revived the error of *Paulus Samoſetenus* and *Photinus*, who taught that Jeſus Chriſt was a mere man. The monks declared openly againſt him, and, with ſome of the moſt conſiderable men in Conſtantinople, ſeparated themſelves from his communion. Several biſhops wrote to him earneſt perſuaſives to acknowledge that Mary was the mother of God; and when he would not comply, they procured his condemnation

* *Socrates.*

condemnation in the council of Epheſus, which deprived him of his ſee. He then retired to his ancient monaſtery at Antioch, whence he was taken four years afterwards by the emperor's order, and baniſhed in 435 to Tarſus. That city being taken and deſtroyed by the barbarians, he was removed to Panopolis, a city of Thebais; where he was not ſuffered to remain long, but was compelled to go from place to place, till, being in one of his journeys mortally bruiſed by a fall, death relieved him from the fury of his perſecutors.

If we examine ſuch of his writings as remain, we ſhall find that he was very unjuſtly condemned. It appears that he rejected the errors of *Ebion*, *Paulus Samoſatenus*, and *Photinus;* that he maintained in expreſs terms, that the divine Word was united to the human nature in Jeſus Chriſt in the moſt ſtrict and intimate ſenſe poſſible; that theſe two natures, in this ſtate of union, make but one Chriſt and one perſon; that the properties of the Divine and human natures may both be attributed to this perſon; and that Jeſus Chriſt may be ſaid to have been born of a virgin, to have ſuffered and died; but he never would admit that God could be ſaid to have been born, to have ſuffered, or to have died.—When we conſider that every perſon partakes of the ſubſtance of his mother, and that it is this which conſtitutes the parental and filial relation between them, it is indeed ſurpriſing that the expreſſion "Mother of God" ſhould ever have been admitted into the Chriſtian church, or that any man who underſtands the meaning of the words ſhould condemn Neſtorius for not having uſed them.

NESTUS, or NESSUS, a river which ſeparates Thrace from Macedonia. It falls into the Ægean ſea near the iſland Thaſos. It is ſometimes called *Neſus* and *Neſſus*.

NET, a device for catching fiſh and fowl. See the article FISHERY.

The taking fowls by nets is the readieſt and moſt advantageous of all others, where numbers are to be taken. The making the nets is very eaſy, and what every true ſportſman ought to be able to do for himſelf. All the neceſſary tools are wooden needles, of which there ſhould be ſeveral of different ſizes, ſome round and others flat; a pair of round pointed and flat ſciſſars; and a wheel to wind off the thread. The packthread is to be of different ſtrength and thickneſs, according to the ſort of birds to be taken; and the general ſize of the meſhes, if not for very ſmall birds, is two inches from point to point. The nets ſhould neither be made too deep nor too long, for they are then difficult to manage; and they muſt be verged on each ſide with twiſted thread. The natural colour of the thread is too bright and pale, and is therefore in many caſes to be altered. The moſt uſual colour is the ruſſet; which is to be obtained by plunging the net, after it is made, into a tanners pit, and letting it lie there till it be ſufficiently tinged: this is of a double ſervice to the net, ſince it preſerves the thread as well as alters the colour. The green colour is given by chapping ſome green wheat and boiling it in water, and then ſoaking the net in this green tincture. The yellow colour is given in the ſame manner with the decoction of celandine; which gives a pale ſtraw-colour, which is the colour of ſtubble in the harveſt-time. The brown nets are to be uſed on ploughed lands, the green on graſs grounds, and the yellow on ſtubble lands.

NET-Day, among fowlers, a net generally uſed for taking ſuch ſmall birds as play in the air, and will ſtoop either to prey, gig, or the like; as larks, linnets, buntings, &c. The time of the year for uſing this net is from Auguſt to November; and the beſt time is very early in the morning: and it is to be obſerved, that the milder the air, and the brighter the ſun is, the better will be the ſport, and of longer continuance. The place where this net ſhould be laid, ought to be plain champaign, either on ſhort ſtubbles, green lays, or flat meadows, near corn fields, and ſomewhat remote from towns and villages: you muſt be ſure to let your net lie cloſe to the ground, that the birds creep not out and make their eſcape.—The net is made of a fine packthread with a ſmall meſh, not exceeding half an inch ſquare; it muſt be three fathoms long, and but one broad: it muſt be verged about with a ſmall but ſtrong cord; and the two ends extended upon two ſmall long poles, ſuitable to the breadth of the net, with four ſtakes, tail-ſtrings, and drawing-lines.—This net is compoſed of two, which muſt be exactly alike; and are to be laid oppoſite to one another, ſo even and cloſe, that when they are drawn and pulled over, the ſides muſt meet and touch each other. You muſt ſtake this net down with ſtrong ſtakes, very ſtiff on their lines, ſo that you may with a nimble touch caſt them to and fro at pleaſure; then faſten your drawing-cord or hand-lines (of which there muſt be a dozen at leaſt, and each two yards long) to the upper end of the foremoſt ſtaves: and ſo extend them of ſuch a ſtraitneſs, that with a little ſtrength they may riſe up in the nets and caſt them over.

Sportſman's Dict.

Your nets being thus laid, place you gigs, or playing-wantons, about 20 or 30 paces beyond, and as much on this ſide your nets: the gigs muſt be faſtened to the tops of long poles, and turned into the wind, ſo as they may play to make a noiſe therein. Theſe gigs are a ſort of toys made of long gooſe-feathers, like ſhuttle-cocks, and with little ſmall tunnels of wood running in broad and flat ſwan-quills, made round like a ſmall hoop; and ſo, with longer ſtrings faſtened to a pole, will, with any ſmall wind or air, move after ſuch a manner, that birds will come in great flocks to play about them.

When you have placed your gigs, then place your ſtale; which is a ſmall ſtake of wood, to prick down into the earth, having in it a mortice-hole, in which a ſmall and ſlender piece of wood, about two feet long, is faſtened, ſo as it may move up and down at pleaſure: and faſten to this longer ſtick a ſmall line, which, running through a hole in the ſtick abovementioned, and ſo coming up to the place where you are to ſit, you may, by drawing the line up and down with your right hand, raiſe up the longer ſtick as you ſee occaſion.

Faſten a live lark, or ſuch like bird, to this longer ſtick, which, with the line making it to ſtir up and down by your pulling, will entice the birds to come to your net.

There is another ſtale, or enticement, to draw on theſe birds, called a *looking glaſs;* which is a round ſtake of wood, as big as a man's arm, made very ſharp at the end, to thruſt it into the ground: they make it very hollow in the upper part, above five fingers deep; into which hollow they place a three-ſquare piece of wood about a foot long, and each two inches broad, lying upon the top of the ſtake, and going with a foot into the hollowneſs: which foot muſt have a great knob at the top, and another at the bottom, with a deep ſlenderneſs between; to which ſlenderneſs you are to faſten a ſmall packthread, which, running through a hole in the ſide of the ſtake, muſt come up to the place where you ſit. The three-ſquare piece of wood which lies on the top of the ſtake, muſt be of ſuch a poiſe and evenneſs, and the foot of the ſocket ſo ſmooth and round, that it may whirl and turn round upon the leaſt touch; winding the packthread ſo many times about it, which being ſuddenly drawn, and as ſuddenly let go, will keep the engine in a conſtant rotatory motion: then faſten with glue on the uppermoſt flat ſquares of the three-ſquare piece, about 20 ſmall pieces of looking-glaſs, and paint all the ſquare wood between them of a light and lively red; which, in the continual motion, will give ſuch a reflection, that the birds will play about to admiration until they are taken.

Both this and the other ſtale are to be placed in the middle between the two nets, about two or three feet diſtance from each other; ſo that, in the falling of the nets, the cords may not touch or annoy them: neither muſt they ſtand one before or after another; the glaſs being kept in a continual motion, and the bird very often fluttering. Having placed your nets in this manner, as alſo your gigs and ſtales, go to the further end of your long drawing lines and ſtale lines; and, having placed yourſelf, lay the main drawing line acroſs your thigh, and, with your left, pull the ſtale line to ſhow the birds; and when you perceive them to play near and about your nets and ſtales, then pull the net over with both hands, with a quick but not too haſty motion; for otherwiſe your ſport will be ſpoiled.

See Plate CCCXLV. where A ſhows the bodies of the main net, and how they ought to be laid. B, the tail lines, or the hinder lines, ſtaked to the ground. C, the fore lines ſtaked alſo to the ground. D, the bird ſtale. E, the looking-glaſs ſtale. G, the line which draws the bird ſtale. H, the line that draws the glaſs ſtale. I, the drawing, double lines of the nets, which pulls them over. K, the ſtakes which ſtake down the four nether points of the nets and the two tail lines. L, the ſtakes that ſtake down the fore lines. M, the ſingle line, with the wooden button to pull the net over with. N, the ſtake that ſtakes down the ſingle line, and where the man ſhould ſit; and O, the gig.

Net, *Neat*, in commerce, ſomething pure, and unadulterated with any foreign mixture.

Thus, wines are ſaid to be *net* when not falſified or balderdaſhed; and coffee, rice, pepper, &c. are *net* when the filth and ordures are ſeparated from them. See Neat.

A diamond is ſaid to be *net* when it has no ſtains or flaws; a cryſtal, when tranſparent throughout.

Net is alſo uſed for what remains after the tare has been taken out of the weight of any merchandiſe, *i. e.* when it is weighed clear of all package. See Tare.

Thus we ſay, a barrel of cochineal weighs 450 pounds; the tare is 50 pounds, and there remain *net* 400 pounds.

Net Produce, a term uſed to expreſs what any commodity has yielded, all tare and charges deducted.

The merchants ſometimes uſe the Italian words *netto proceduto*, for net produce.

NETHERLANDS, anciently called *Belgia*, but ſince denominated *Low Countries* or *Netherlands*, from their low ſituation, are ſituated between 2° and 7° of eaſt longitude, and between 50° and 53° 30′ of north latitude: and are bounded by the German ſea on the north, Germany on the eaſt, by Lorrain and France on the ſouth, and by another part of France and the Britiſh ſeas on the weſt; extending near 300 miles in length from north to ſouth, and 200 miles in breadth from eaſt to weſt. They conſiſt of 17 provinces; 10 of which are called the *Auſtrian and French Netherlands*, and the other ſeven the *United Provinces*.

The greateſt part of the Netherlands was conquered by the Romans; and that part which lies towards Gaul continued in their ſubjection till the decline of that empire; after which the Francs became maſters of it; and, under the French monarchy, it was part of the kingdom of Metz or Auſtraſia.

Towards the end of the 15th century Maximilian of Auſtria, ſon of the emperor Ferdinand III. acquired, by marrying the only daughter of the duke of Burgundy, the duchies of Brabant, Limburg, and Luxemburg; the counties of Flanders, Burgundy, Hainault, Holland, Zealand, and Namur; and the lordſhips of Frieſland. Philip of Auſtria, ſon to Maximilian and Mary, married Jane the daughter of Ferdinand king of Arragon, and of Iſabella queen of Caſtile; by which means their ſon Charles inherited not only almoſt all Spain and the great countries then lately diſcovered in America, but alſo thoſe noble provinces of the Netherlands, and was choſen emperor under the name of *Charles V.* Towards the latter end of the 1527, he added to his dominions the temporalities of the biſhoprick of Utrecht on both ſides of the Yſſel; and Henry of Bavaria, being diſtreſſed through war with the duke of Guelderland, and tired with the continued rebellion of his own ſubjects, ſurrendered to the emperor the temporalities of his dioceſe, which was confirmed by the pope, and the ſtates of the country. In 1536, Charles V. bought of Charles of Egmond the reverſion of the duchy of Guelderland and of the county of Zutphen, in caſe that prince ſhould die without iſſue. The ſame year the city of Groningen took the oath of allegiance, and ſubmitted to Charles V. and in 1543 he put a garriſon into the city of Cambray, and built a citadel there. Having thus united the 17 provinces, as it were in one body, he ordered that they ſhould continue for ever under the ſame prince, without being ever ſeparated or diſmembered; for which purpoſe he publiſhed in November 1549, with the conſent and at the requeſt of the ſtates of all the provinces, a perpetual and irrevocable edict or law, by which it was enacted, that in order to keep all thoſe provinces together under one and the ſame prince, the right of repreſentation, with regard to the ſucceſſion of a prince or princeſs, ſhould take place for ever, both in a direct and collateral line, notwithſtanding the common laws of ſome provinces to the contrary. Charles had even a mind to incorporate theſe provinces with the Germanic body, and to make of them a circle of the empire, under the title of the circle of Burgundy, in order thereby to engage princes of the empire to concern themſelves for the preſervation of thoſe provinces. But the Netherlands, always jealous of their liberty, did not ſeem to like that incorporation; and when they were demanded to pay their ſhare towards the expences of the empire, they refuſed it: whereupon the princes of Germany refuſed, in their turn, to take any part in the wars in Flanders, and looked upon thoſe provinces as by no means belonging to the Germanic body.

Philip of Auſtria and his ſon Charles, who were born in the Netherlands, had for theſe provinces that natural affection which men uſe to have for their native country; and, knowing how jealous the inhabitants were of their liberty, and of the privileges granted to them by their former princes, they took great care to preſerve them, and ſuffered willingly that the ſtates, who were the guardians of the people's liberty and privileges, ſhould in a manner ſhare the ſupreme authority with them. Philip II. ſon to the emperor Charles V. had not the ſame affection for the Netherlands, nor thoſe generous ſentiments which his father had endeavoured to inſpire him with. Being born in Spain of a Portugueſe woman, he had no regard but for his native country; and, when he removed out of the Netherlands, he left them to the weak government of a woman, to the proud and haughty ſpirit of Cardinal de Grenville, and to the wild ambition of ſome lords of theſe provinces, who availing themſelves of the imprudent conduct and continual blunders of the council of Spain, found their private intereſt in the diſturbances they could not fail to produce. Philip II. alſo, inſtead of the mild and moderate meaſures which his predeceſſors had ſucceſsfully employed on many occaſions, as beſt ſuiting the genius and temper of the people, had recourſe to the moſt violent and cruel proceedings; which, far from curing the evil, ſerved only to exaſperate it the more and render it incurable. The Spaniards, whom he ſent hither, being born and educated in an abſolute monarchy, jealous of the liberties and envious of the riches of the people, broke through all their privileges, and uſed them almoſt after the ſame manner as they had done the inhabitants of their new and ill-gotten dominions in America. This treatment occaſioned a general inſurrection. The counts Hoorn, Egmont, and the prince of Orange, appearing at the head of it, and Luther's reformation gaining ground about the ſame time in the Netherlands, his diſciples joined the malecontents: whereupon King Philip introduced a kind of inquiſition in order to ſuppreſs them, and many thouſands were put to death by that court, beſides thoſe that periſhed by the ſword: for theſe perſecutions and encroachments had occaſioned a civil war, in which ſeveral battles were fought. The counts Hoorn and Egmont were taken and beheaded: but the prince of Orange, retiring into Holland, did, by the aſſiſtance of England and France, preſerve Holland and ſome of the adjacent provinces, which entered into a treaty for their mutual defence at Utrecht in 1579, and they have ever ſince been ſtyled the *United Provinces*; but the other provinces were reduced to the obedience of Spain by the duke of Alva and other Spaniſh generals. However, their ancient privileges were in a great meaſure reſtored; every province was allowed its great council or parliament, whoſe concurrence was required to the making of laws, and raiſing money for the government, though theſe aſſemblies were too often obliged to follow the dictates of the court.

The late emperor Joſeph II. endeavoured to deprive them even of the form of their free conſtitution; and he might very probably have ſucceeded, had he not attempted at the ſame time a reformation of the church. The Auſtrian Netherlands are wholly Catholic, and ſo bigotted to the Romiſh ſuperſtition, that though they had tamely ſubmitted to many encroachments of the archducal houſe on their civil right, no ſooner did the monarch encroach upon the property of the holy mother church than they reſiſted his authority, and claimed all their ancient privileges political and religious. The ſame attachment to their ancient faith and worſhip made them very lately contribute to expel from their territories the French whom they had invited to relieve them from the Auſtrian yoke. Thus her religious bigotry for once ſaved a free people from the iron rod of deſpotiſm on the one hand, and the cruelties of frantic democrates on the other. The provinces under the government of France were, till the late revolution, under the ſame ſevere arbitrary dominion as the other ſubjects of that crown, and they now experience the ſame miſeries with the reſt of the republic.

The Spaniards continued poſſeſſed of almoſt eight of theſe provinces, until the duke of Marlborough, general of the allies, gained the memorable victory of Ramillies. After which Bruſſels the capital, and great part of theſe provinces, acknowledged Charles VI. (afterwards emperor) their ſovereign; and his daughter, the late empreſs queen, remained poſſeſſed of them till the war that followed the death of her father, when the French made an entire conqueſt of them, except part of the province of Luxemburg; but they were reſtored by the peace of Aix-la-Chapelle in 1748, and the French retained only Artois, the Cambreſis, part of Flanders, part of Hainault, and part of Luxemburg, of which they have had the dominion now upwards of eighty years.

The ſoil is generally fruitful, but differs in the ſeveral parts. The climate alſo differs in the ſeveral provinces; in thoſe towards the ſouth it does not differ much from that of England, though the ſeaſons are more regular. In the northern provinces the winter is generally very ſharp, and the ſummer ſultry hot; but the extreme cold and exceſſive heat ſeldom continue above five or ſix weeks. The air is reckoned very wholeſome, but is ſubject to thick fogs in winter, through the moiſtneſs of the country, which would be very noxious, were it not for the dry eaſterly winds, which, blowing off a long continent for two or three months in the year, clear the air, and occaſion very ſharp froſts in January and February; during which, the ports, rivers, and canals, are commonly ſhut up The face of the country is low and flat; for, except ſome ſmall hills and a few riſing grounds in Utrecht and Guelderland, and in the parts lying towards Germany, there is no hill to be ſeen in the whole 17 provinces. This is the reaſon that they have been called the Low Countries. French Flanders abounds in grain, vegetables, flax, and cattle, but is in want of wood.

For the *Dutch Netherlands*, ſee *United Provinces*.

NETHINIMS, among the Jews, the poſterity of the Gibeonites, who were condemned by Joſhua to be hewers of wood and drawers of water for the houſe of God.

NETOPION, a name given by the ancients to a very fragrant and coſtly ointment, conſiſting of a great number of the fineſt ſpicy ingredients. Hippocrates, in his Treatiſe of the Diſeaſes of Women, frequently preſcribes the netopion in diſeaſes of the uterus; and in other places he ſpeaks of its being poured into the ear as a remedy for deafneſs; theſe compoſitions, by their attenuating qualities, dividing the viſcous and thick humours. The word *netopion* is alſo ſometimes uſed to expreſs the *unguentum Ægyptiacum*, and ſometimes ſimply for oil of almonds.

NETSCHER (Gaſpard), an eminent painter, born at Prague in Bohemia in 1639. His father dying while he was an engineer in the Poliſh ſervice, his mother was obliged, on account of her religion, ſuddenly to leave Prague with her three ſons. When ſhe had proceeded three leagues, ſhe ſtopped at a caſtle; which being ſoon after beſieged, two of her ſons were ſtarved to death; but ſhe herſelf found means to eſcape out of the fortreſs by night, and to ſave her only remaining child. Carrying him in her arms, ſhe reached Arnheim in Guelderland, where ſhe found means to ſupport herſelf, and breed up her ſon. At length a doctor of phyſic took young Netſcher into his patronage, with the view of giving him an education proper for a phyſician: but Netſcher's genius leading him to painting, he could not forbear ſcrawling out deſigns upon the paper on which he wrote his themes; and it being found impoſſible to conquer his fondneſs for drawing, he was ſent to a glazier, who was the only perſon in the town that underſtood drawing. Netſcher ſoon finding himſelf above receiving any farther aſſiſtance from his maſter, was ſent to Deventer, to a painter named *Terburg*, who was an able artiſt and a burgomaſter of the town; and having acquired under him a great command of his pencil, went to Holland, where he worked a long time for the dealers in pictures, who paid him very little for his pieces, which they ſold at a high price. Diſguſted at this ungenerous treatment, he reſolved to go to Rome; and for that purpoſe embarked on board a veſſel bound for Bourdeaux. But his marrying in that city prevented his travelling into Italy; and therefore, returning into Holland, he ſettled at the Hague; where obſerving that portrait-painting was the moſt profitable, he applied himſelf ſolely to it, and acquired ſuch reputation, thas there is not a conſiderable family in Holland that has not ſome of his portraits; and beſides, the greateſt part of the foreign miniſters could not think of quitting Holland without carrying with them one of Netſcher's portraits, whence they are to be ſeen all over Europe. He died at the Hague, in 1684; leaving two ſons, Theodore and Conſtantine Netſcher, both of them good portrait painters.

NETTINGS, in a ſhip, a ſort of grates made of ſmall ropes ſeized together with rope yarn or twine, and fixed on the quarters and in the tops; they are ſometimes ſtretched upon the ledges from the waſte-trees to the roof trees, from the top of the forecaſtle to the poop, and ſometimes are laid in the waſte of a ſhip to ſerve inſtead of gratings,

NETTLE, in botany. See Urtica.

Sea Nettle. See Medusa and *Animal-Flower*.

Nettle-Tree. See Celtis.

NETTUNO, a handſome town of Italy, in the Campagna di Roma. It is but thinly peopled, though ſeated in a fertile ſoil. The inhabitants are almoſt all hunters. E. Long. 12. 57. N. Lat. 41. 30.

NEVA, a river at Peterſburgh, in Ruſſia. The views upon the banks exhibit the moſt grand and lively ſcenes. The river is in moſt places broader than the Thames at London. It is deep, rapid, and tranſparent as cryſtal, and its banks are lined on each ſide with a continued range of handſome buildings. On the north ſide the fortreſs, the academy of ſciences and that of art are the moſt ſtriking objects; on the oppoſite ſide are the imperial palace; the admiralty, the manſions of many Ruſſian nobles, and the Engliſh line, ſo called becauſe (a few houſes excepted) the whole row is occupied by the Engliſh merchants. In front of theſe buildings, on the ſouth ſide, is the quay, which ſtretches for three miles, except where it is interrupted by the admiralty; and the Neva, during the whole of that ſpace, has been lately embanked at the expence of the empreſs by a wall, parapet, and pavement of hewn granite; a moſt elegant and durable monument of imperial munificence. There is a communication between the oppoſites ſides of the river by a bridge of pontoons, which, when any thing is apprehended from the force of ice ruſhing down the ſtream, can be, and is generally indeed, removed. The great depth of the river, it appears, prevents the building of a ſtone bridge; and, if it could be built, there is no reaſon to ſuppoſe it could poſſibly reſiſt the force of thoſe vaſt ſhoals of ice which in the beginning of winter come down this rapid river. An attempt, however, has been made to remedy this inconvenience; and a Ruſſian peaſant has actually projected the plan of throwing a wooden bridge of one arch acroſs it, which in its narroweſt part is 980 feet in breadth. As we think this is a matter of very conſiderable importance, as well as of curioſity, we ſhall give the following copious account of the plan and its author, in Mr Coxe's own words; who tells us that the artiſt had then executed a model 98 feet in length, which he ſaw and examined with conſiderable attention.

"The bridge is upon the ſame principle with that of Shaffhauſen, excepting that the mechaniſm is more complicated, and that the road is not ſo level. I ſhall attempt to deſcribe it by ſuppoſing it finiſhed, as that will convey the beſt idea of the plan. The bridge is roofed at the top, and covered at the ſides; it is formed by four frames of timber, two on each ſide, compoſed of various beams or truſſes, which ſupport the whole machine. The road is not, as is uſual, carried over the top of the arch, but is ſuſpended in the middle.

"The following proportions I noted down with the greateſt exactneſs at the time when they were explained to me by the artiſt.

Length of the abutment on the north end,	658 feet.
Span of the arch, - - -	980
Length of the abutment on the ſouth end,	658
Length of the whole ſtructure, including the abutments, - -	2296
The plane of the road upon its firſt aſcent makes an angle of five degrees with the ordinary ſurface of the river.	
Mean level of the river to the top of the bridge in the centre, -	168
Ditto to the bottom of the bridge in the centre, - -	126
Height of the bridge from the bottom to the top in the centre, - -	42
Height from the bottom of the bridge in the centre to the road, -	7
Height from the bottom of ditto to the water, - -	84
Height from the water to the ſpring of the arch, - - -	56

So that there is a difference of 35 feet between the road at the ſpring of the arch and the road at the centre; in other words, an aſcent of 35 feet in half 980, or in the ſpace of 490 feet, which is little more than eight-tenths of an inch to a foot. The bridge is broadeſt towards the ſides, and diminiſhes towards the centre.

In the broadeſt part it is -	168 feet.
In the centre or narroweſt -	42
The breadth of the road is -	28

"The artiſt informed me, that to complete the bridge would require 49,650 iron nails, 12,908 large trees, 5500 beams to ſtrengthen them, and that it would coſt 300,000 roubles, or £60,000l. He ſpeaks of this bold project with the uſual warmth of genius; and is perfectly convinced that it would be practicable. I muſt own that I am of the ſame opinion, though I hazard it with great diffidence. What a noble effect would be produced by a bridge ſtriking acroſs the Neva, with an arch 980 feet wide, and towering 168 feet from the ſurface of the water? The deſcription of ſuch a bridge ſeems almoſt chimerical; and yet upon inſpection of the model we become reconciled to the idea. But whether the execution of this ſtupendous work may deemed poſſible or not, the model itſelf is worthy of attention, and reflects the higheſt honour on the inventive faculties of that unimproved genius. It is ſo compactly conſtructed, and of ſuch uniform ſolidity, that it has ſupported 3540 pood, or 127,440 pounds, without having in the leaſt ſwerved from its direction, which I am told is far more, in proportion to its ſize, than the bridge if completed would have occaſion to ſuſtain from the preſſure of the carriages added to its own weight.

"The perſon who projected this plan is a common Ruſſian peaſant. This extraordinary genius was apprentice to a ſhopkeeper at Niſhnei Novogorod: oppoſite to his dwelling was a wooden clock, which excited his curioſity. By repeated examinations he comprehended the internal ſtructure, and without any aſſiſtance formed one exactly ſimilar in its proportion and materials. His ſucceſs in this firſt eſſay urged him to undertake the conſtruction of metal clocks and watches. The empreſs, hearing of theſe wonderful exertions of his native genius, took him under her protection, and ſent him to England; from whence, on account of the difficulties attending his ignorance of the language, he ſoon returned to Ruſſia. I ſaw a repeating watch of his workmanſhip at the Academy of Sciences: it is about the bigneſs of an egg; in the inſide is repreſented the tomb of our Saviour, with the ſtone at the entrance, and the centinels upon duty: ſuddenly the ſtone is removed, the centinels fall down, the angels appear, the women enter the ſepulchre, and the ſame chant is heard which is performed on Eaſter-eve. Theſe are trifling, although curious performances; but the very planning of the bridge was a moſt ſublime conception. This perſon, whoſe name is *Kulibin*, bears the appearance of a Ruſſian peaſant; he has a long beard, and wears the common dreſs of the country. He receives a penſion from the empreſs, and is encouraged to follow the bent of his mechanical genius (A)."

NEVEL, or NEBEL, in the Jewiſh antiquities, a kind of muſical inſtrument. See NABLUM. Plate CCCXLIV.

NEVERS is the capital of the Nevernois in France, and government of Orleanois. It is ſituated in E. longitude 3. 15. N. latitude 46. 50. on the river Loire, which here receives the rivulet *Nievre*, from which this city derives its name. It is a place of great antiquity, ſuppoſed to be Cæſar's Noviodunum in Æduis, where he erected magazines for his armies. Francis I. made it a duchy and peerage in 1521, in favour of Francis of Cleve, to whom it came by marriage. It devolved afterwards to the houſe of Mantua, and then to the Palatine family, who 1651 ſold it to Cardinal Mazarine. The cardinal obtained a title of duke and peer for his nephew Philip Mancini, in whoſe family it continued till the late revolution, though it is impoſſible, in the preſent unſettled ſtate of France, to ſay whoſe property it may be now. The town is fortified with walls, defended with many high towers and deep ditches, and is the ſeat of a biſhopric, ſuffragan of Sens, as likewiſe of a bailiwic and chamber of accounts.

(A) We have given this detail in Mr Coxe's own words, as it appears to us to deſerve attention on account of the greatneſs of the project, which would have excited admiration had it been attempted by one enlightened by ſcience and liberal arts, much more when it comes through the humble medium of a Ruſſian peaſant. It was never executed, as we are juſt informed by a gentleman who left St Peterſburgh about the beginning of June 1793; but the model remains, and is ſtill ſhown. The ſame gentleman (we quote his own words) adds, "that every mechanic thinks it practicable; and that the general belief is, that the empreſs would have built it, had ſhe not found uſe for all her money in carrying on her warlike and diplomatic tranſactions with other courts."

counts. There is a ſtone bridge on the Loire, with twenty arches, a draw-bridge on each ſide, and towers to defend them. The cathedral is dedicated to St Cyr. There are eleven pariſhes in the town, and a great many religious houſes. The Jeſuits college near the gate des Ardeliers is a handſome ſtructure. The palace of the dukes of Nevers has a large front between two great towers, with a court on one ſide and a garden on the other. Here it was that John Caſimir king of Poland died the 16th of December 1672. Near this palace ſtands the convent of Cordeliers, who have a magnificent church, in which the tombs of duke John and Catharine of Bourbon on the right, and thoſe of Lewis of Gonzaga duke of Nevers, and Henrietta of Cleves his wife, merit attention.—— This town is famous for its glaſs-manufacture and earthen ware, and is ſaid to contain about 8000 inhabitants.

In the centre of Nevers, on the ſummit of a hill, is built the palace of the ancient dukes. It appears to have been conſtructed in the ſixteenth century, and, though beginning to exhibit marks of decay, is yet a model of the beauty and delicacy of the Gothic architecture. The apartments are hung with tapeſtry of 200 years old, which have an air of groteſque and rude magnificence. There is in one of the chambers a portrait of Madame de Monteſpan, who appears riſing from a ſuperb couch, the curtains of which are drawn back, and ſupported by Cupids. Her attitude is half voluptuous, half contemplative. She is dreſſed in a negligent diſhabille, and her hair floats down over her ſhoulders and neck in waving ringlets. Her head reſts on her left hand, and one of her feet is concealed by her robe; the other, which is naked to the mid-leg, and on which the painter with great taſte, has exhauſted all his art, is placed on an embroidered cuſhion. Her ſlippers are thrown careleſsly by.

NEUCHATTEL, a tolerably handſome town of Swiſſerland, capital of a county of the ſame name. There are ſeveral ancient ruins near it, which ſhow its former extent; and there are two large churches, beſides a caſtle where the governor reſides. The town contains about 3000 inhabitants. It is ſituated partly on a ſmall plain, between Mount Jura and the lake of Neuchattel, which is 17 miles long and five broad; the ſide of the harbour is the uſual walk of the inhabitants. Part of it too is built upon the ſide of the mountain; whence ſome of its ſtreets are very ſteep. In this ſmall place ſeveral public works have lately been executed, which Mr Coxe thinks are far beyond the revenues, or even the wants, of ſuch a little ſtate. Among theſe he inſtances a ſuperb cauſeway and a town-houſe "built (ſays he) of ſuch ſolid materials as if it was intended to ſurvive to the moſt diſtant poſterity, and to rival the duration of the much-famed Roman capitol." At the beginning of the preſent century, commerce was very little followed in this town, owing to an abſurd opinion which prevailed among the inhabitants of its being diſgraceful; but this prejudice is now extinguiſhed, and the town in a much more flouriſhing ſituation than before. The chief article of exportation is wine, which is much eſteemed; and manufactures of printed linens and cotton have been eſtabliſhed with conſiderable ſucceſs. The flouriſhing ſtate of Neuchattel is principally owing to the benefactions of Mr David Pury, late banker of the court at Liſbon. He was born at Neuchattel in 1709; but having received his education there, he quitted it in great poverty and repaired to Geneva, where he ſerved his apprenticeſhip, but in what line is not mentioned. From Geneva he went to London, where he acted as clerk to a dealer in precious ſtones, and acquired great reputation by eſtimating the value of diamonds at ſight. After a long reſidence in England he went to Liſbon, where he carried on a very extenſive commerce: and having been appointed court-banker, his fortune rapidly increaſed. His generoſity, however, kept pace with his wealth; and he not only remitted large ſums to Neuchattel while living, but left his country his heir when he died. His contributions in all are eſtimated by Mr Coxe at 200,000l.; a conſiderable part of which has been employed in conſtructing the public works already mentioned. Mr Coxe hints, that notwithſtanding the ſuperb edifices already mentioned, there are many conveniencies ſtill wanting to render Neuchattel agreeable; the public walks, for inſtance, might be greatly improved; the ſtreets, which are very dirty, might be kept clean; and a torrent which runs through the town, and frequently threatens it with inundations, might be turned. Encouragement ought alſo to be given to literature; for our author obſerves, that the inhabitants of Neuchattel are much more ignorant than thoſe of other parts in Swiſſerland, which no doubt is in a great meaſure owing to their having not a ſingle ſeminary of learning which deſerves the name in the place. It has a grand and little council: the firſt is compoſed of 40 perſons, with two maſters of the keys; the little council conſiſts of 24 members, comprehending the mayor, who is preſident. Theſe two councils aſſemble regularly every month. The eccleſiaſtics likewiſe aſſemble every month, to conſult on affairs belonging to the church, and to fill up the places of miniſters that die. They chooſe a dean every year, who is preſident of the general aſſemblies, which are called *claſſes*; and ſometimes he is confirmed in this dignity. E. Long. 7. 10. N. Lat. 47. 5.

NEUCHATTEL, a ſovereign county of Swiſſerland, bounded on the weſt by the Franche Compte, on the north by the biſhopric of Baſle, and on the eaſt and ſouth by the cantons of Berne and Friburg. This principality of Neuchattel and Vallengin extend from the lake of Neuchattel to the borders of Franche Compte, being in length about 12 leagues, and ſix in breadth. The plain with the lower part of the mountains is occupied by the diſtrict of Neuchattel, but Vallengin is totally encloſed by Jura. Parallel chains of theſe mountains run from eaſt to weſt, forming ſeveral valleys in the moſt elevated parts. The lower grounds of this chain conſiſt of arable lands and vineyards; the higher of large tracts of foreſt, which in many parts have been cleared and converted into paſture grounds, intermixed with fields of barley and oats. The inhabitants are numerous, and remarkable for their genius, politeneſs, and active induſtry. It contains three cities, one town, 90 villages, and about 300 houſes diſperſed in the mountains. The inhabitants are all Proteſtants, except two Roman catholic villages: and in 1529 they entered into a ſtrict alliance with the cantons of Berne, Friburg, Soleure, and Lucern. The air is healthy and temperate, but the ſoil not everywhere equally fertile: however, there are large vineyards, which produce white and red wine, which laſt is excellent. The paſtures on the mountains feed a great number of all ſorts of cattle; and there are plenty of deer in the foreſts; beſides large trouts, and other good fiſh, in the lakes and rivers. The mildneſs of the government, and agreeable ſituation of the inhabitants in general in theſe diſtricts, is evident from the great increaſe of population in the ſpace of 32 years. In 1752 they contained only 28,017 ſubjects and 4318 aliens: but in 1784 the number was augmented to 31,576 ſubjects and 9704 aliens; being an increaſe of near a fourth part in that time. The facility with which the burgherſhip of Neuchattel is acquired, may alſo be accounted one of the means of augmenting its population; for between the years 1760 and 1770, the magiſtrates admitted 41 perſons to this privilege; from 1770 to 1780, 46; from 1780 to 1785, 51; in all 138; many of whom had children before they purchaſed their burgherſhip, and 38 of them were foreigners, either German, French, or Dutch.

The diſtricts of Neuchattel and Vallengin now make part of the Pruſſian dominions. It had its own counts for a long time; the laſt of whom dying in 1694 without iſſue, it came to Mary of Orleans ducheſs of Nemours, his only ſiſter, who alſo died without iſſue in 1703. There were then 13 competitors, among whom was Frederick I. king of Pruſſia, who claimed as heir to the prince of Orange. His right was acknowledged by the ſtates of the country in 1707; but in this part of his dominions the Pruſſian monarch is far from having ſuch an abſolute authority as in others. On the acceſſion of Frederick I. ſome general articles were agreed on, by which the prerogatives of the prince and the rights of the people were ſettled. Diſputes, however, occurred betwixt the king and his ſubjects, which were not thoroughly ſettled till the year 1768, when the general articles were not only renewed, but explained wherever their tenor had been miſtaken, confirming alſo ſeveral privileges in favour of the people which had hitherto been equivocal or not duly obſerved. The moſt important of theſe general articles were, 1. The eſtabliſhment of the reformed religion, and the toleration of no other, except in two places where it was already prevalent. 2. No civil or military office to be poſſeſſed by foreigners, that of governor only excepted. 3. All ſubjects have a right to enter into the ſervice of a foreign prince not actually at war with the king as ſovereign of Neuchattel; the ſtate may alſo continue neuter when the king is engaged in wars which do not concern the Helvetic body. 4. The proper adminiſtration of juſtice; for which the three eſtates of Neuchattel and Vallengin ſhall be annually aſſembled. 5. The magiſtrates to hold their places during good behaviour; but of this certain perſons appointed at Neuchattel, and not the king, are to judge. 6. The ſovereign, on his acceſſion, ſhall take an oath to maintain the rights, liberties, and cuſtoms of the people, *written* and *unwritten*.

This laſt article is no leſs important than it is ſingular; for upon an unwritten cuſtom one of their moſt eſſential privileges depends; viz. that the ſovereign ſhall be conſidered only as reſident at Neuchattel. "Now (ſays Mr Coxe), this privilege, in conjunction with the third article juſt cited, forms the baſis of their civil liberty. By the former, the prince, when abſent, can only addreſs his ſubjects through his governor and the council of ſtate; and no ſubject can be tried out of the country, or otherwiſe than by judges appointed by the conſtitution: by the latter, ſhould the king of Pruſſia be at war with all Germany, the people of Neuchattel and Vallengin are by no means obliged to arm in his defence; but individuals may even ſerve againſt him, as long as the powers whom they ſerve are not engaged in any hoſtilities againſt their own country." A remarkable inſtance of this laſt our author gives in the following anecdote. "When Henry duke of Longueville, and ſovereign of Neuchattel was, in 1650, ſent to the caſtle of Vincennes, Felix de Mareval, captain of the Swiſs guards, kept guard in his turn, though he was citizen of Neuchattel, at the door of the priſon where his ſovereign was confined."

The king confers nobility, names the principal officers of ſtate, appoints the preſidents of the courts of juſtice called *chatelins* and *mayors*; but his revenues ſcarcely amount to 5000l. a-year. They ariſe from certain demeſnes; from a ſmall land-tax, the tythes of wine and corn, and a tenth part of the value of all immoveables. No ſubject pays any duty upon goods either exported or imported, except for foreign wines brought into the town itſelf.

Neuchattel enjoys very conſiderable privileges, has the care of the police within its own diſtrict, and is governed by its own magiſtracy conſiſting of a great and little council. The three eſtates of the country form the ſupreme tribunal, and receive appeals from the inferior court of juſtice. They conſiſt of 12 judges divided into three eſtates: the judges in the firſt and ſecond diviſion hold their places for life; but thoſe in the third are choſen annually. The eſtates uſually meet once a-year in the month of May, but are convoked extraordinarily upon particular occaſions, and the town of Neuchattel is always the place of meeting. They are not, however, the repreſentatives of the people, nor do they poſſeſs any legiſlative authority. Properly ſpeaking, they are the ſupreme court of judicature, which receives all appeals, and decides finally upon all cauſes, even thoſe which relate to the ſovereignty of the country, of which we have an example in the revolution of 1707. The ordinary adminiſtration of government is veſted in the council of ſtate, which ſuperintends the general police, and is the medium by which the ſovereign exerciſes his juriſdiction. The members are nominated by the king, and are not reſtricted to any number, but he is always conſidered as perſonally preſiding in the aſſembly; and the preſident has no other powers than thoſe of convoking the aſſembly, propoſing the ſubjects of conſideration, collecting the votes, and deciding when the voices are equal. The ordinances of this council are previouſly communicated to the *miniſtraux* of Neuchattel, who muſt certify that they contain nothing contrary to law. The miniſtraux are a kind of committee from the council of the town, and are intruſted with the adminiſtration of the police. They conſiſt of the two preſidents of that council, four maſter burghers taken from the little council, and the *banneret* or guardian of the liberties of the people. The former ſix are changed every two years; and the banneret is choſen by the general aſſembly of the citizens, and continues in office during ſix years.

When the cauſes are decided in the month of May by the three eſtates, the four judges, who form the third eſtate, retire, and their place is ſupplied by the four miniſtraux. The attorney general then deſires the members of the three eſtates to take into conſideration whether it is neceſſary to frame any new laws. If a new ordinance is propoſed, a declaration is drawn up and delivered to the council of ſtate for their deliberation, whether it be contrary to the prerogatives of the prince or the rights of the ſubject; from thence it is communicated to the council of the town in order to be examined, whether it infringes the privileges of the citizens. If adopted by the council of ſtate and the council of the town, it is propoſed to the prince for his approbation or rejection: in the former caſe it is again publicly read before the three eſtates, and the governor or preſident declares the approbation of the ſovereign. It is then promulgated, or paſſed into a law by the three eſtates. The people of Vallengin have always been conſulted upon the framing a new law ſince the acceſſion of the houſe of Brandenburg. For this purpoſe the three maſter burghers of Vallengin examine, whether it contains any thing inconſiſtent with the franchiſes of that diſtrict; in which caſe they have the power of remonſtrating to the governor in council. Every year, at the concluſion of the aſſembly of the eſtates of Neuchattel, thoſe of Vallengin, as conſtituting the ſupreme court of judicature for that country, meet at Vallengin, and decide finally all appeals from the inferior courts of juſtice. Both principalities are divided into a certain number of diſtricts, each of which has its criminal court of juſtice. Every criminal is brought to trial immediately after he is arreſted, and ſentence is read to him in priſon. Next morning he appears again before the judges, aſſembled in the open air; the former proceedings on the trial are read, and the judges once more deliver their opinion. In capital ſentences the governor is immediately made acquainted with the circumſtances of the caſe; and if he does not mitigate the ſentence, it is put in execution without delay. Torture, though ſeldom uſed, is not entirely aboliſhed in theſe diſtricts. Great circumſpection, however, is made uſe of in judicial proceedings, "which (ſays Mr Coxe) may ſometimes favour the eſcape of the criminal; but the few inſtances of atrocious crimes prove that this humane caution is no encouragement to tranſgreſſions, and is a ſtrong preſumption of the general good morals which prevail among the people. In a word, perſonal liberty is almoſt as tenderly and as ſecurely protected by the laws of this country as by thoſe of our own invaluable conſtitution. Thus the liberties of the people are as well and perhaps better ſecured, than even in the democratical cantons; for although the moſt deſpotic prince in Germany is ſovereign, his power is exceedingly limited. Among the ſtriking circumſtances which characterize this goverment, muſt be mentioned the very liberal encouragment given to ſtrangers who ſettle in the country. They enjoy every privilege of trade and commerce; and in no ſtate are fewer eſſential diſtinctions made between ſtrangers and natives."

NEUFCHATTEAU, a town of France, in Lorrain, and capital of the chatellany of Chatenoi. It is a handſome, populous, trading town; having an abbey of the nuns of St Clair, a commandery of Malta, and ſeveral convents of monks and nuns. It is ſeated in a bottom, in a ſoil fertile in corn, wine, and all the neceſſaries of life, on the river Mouzon. E. Long. 5. 45. Lat. 48. 20.

NEVIS, one of the Caribbee iſlands, lying about ſeven leagues north of Montſerrat, and ſeparated from St Chriſtopher's by a narrow channel. It makes a beautiful appearance from the ſea, being a large conical mountain covered with fine trees, of any eaſy aſcent on every ſide, and entirely cultivated. The circumference is about 21 miles, with a conſiderable tract of level ground all around. The climate in the lower part is reckoned to be warmer than Barbadoes, but it is more temperate towards the ſummit. The ſoil is very fine in the lower part, but grows coarſer as we aſcend. The productions are nearly the ſame with thoſe of St Chriſtopher. There are three pretty good roads or bays, with ſmall towns in their vicinity; Charles Town, Moreton Bay, and Newcaſtle. This pleaſant iſland was ſettled under the auſpices of Sir Thomas Warner from St Chriſtopher's. His ſucceſſor, Governer Lake, was conſidered as the Solon of this little country, in which he diſpoſed of every thing with ſuch prudence, wiſdom, and juſtice, as procured him an high reputation with the French as well as Engliſh. In the Dutch war they met with ſome diſturbance from the French; but by being covered by an Engliſh ſquadron, the enemy were obliged to deſiſt from their intended invaſion, after a ſmart engagement in ſight of the iſland. Sir William Stapleton ſometimes reſided here, and Sir Nathaniel Johnſon conſtantly, at which time the inhabitants of Nevis were computed at 30,000. In the war immediately after the revolution, they exerted themſelves gallantly, and had two regiments of 300 men each. In that of Queen Anne they behaved equally well, though they were leſs fortunate; for the French landing with a ſuperior force, and having inveigled moſt of their ſlaves, they were forced to capitulate. About 4000 of theſe ſlaves the French carried away and ſold to the Spaniards, to work in their mines. The parliament, after making due inquiry into the loſſes they had ſuſtained, voted them about a third part of the ſum in which they had ſuffered. Theſe loſſes by war, an epidemic diſeaſe, and repeated hurricanes, exceedingly diminiſhed the number of the people. They are now thought not to exceed 2000 or 3000 whites, and 6000 blacks. There is here a lieutenant governor, with a council, and an aſſembly, which is compoſed of three members from each of the five pariſhes into which the iſland is divided. The commodities are cotton and ſugar; and about 20 ſail of ſhips are annually employed in this trade.

NEURADA, in botany: A genus of the decagynia order, belonging to the decandria claſs of plants; and in the natural method ranking under the 13th order, *Succulentæ*. The calyx is quinquepartite; there are five petals; the capſule inferior, decemlocular, decaſpermous,

mous, and aculeated. There is only one ſpecies, the *procumbens*. The whole plant is white and woolly: it ſends off numerous ſtalks in every direction, which lie flat on the ground: the leaves ſtand on ſhort footſtalks; they are of an oval ſhape, and plaited like thoſe of the *ladies mantle*. It is a native of the warm climates, and found on dry parched grounds.

NEURITICS, in pharmacy, medicines uſeful in diſorders of the nerves.

NEUROGRAPHY, ſignifies a deſcription of the nerves. See ANATOMY, N° 136.

NEUROPTERA. See ZOOLOGY.

NEUTER, a perſon indifferent, who has eſpouſed neither party, and is neither friend nor foe.

A judge ought to be neuter in the cauſes he judges; in queſtions, where reaſon appears neuter, a man ſhould ever incline to the ſide of the unhappy.

NEUTER, in grammar, denotes a ſort of gender of nouns, which are neither maſculine nor feminine. See GENDER.

The Latins have three kinds of genders, maſculine, feminine, and neuter. In Engliſh, and other modern tongues, there is no ſuch thing as neuter nouns. See NOUN.

Verbs NEUTER, by ſome grammarians called *intranſitive verbs*, are thoſe which govern nothing, and that are neither active nor poſitive. See VERB.

When the action expreſſed by the verb has no object to fall upon, but the verb alone ſupplies the whole idea of the action; the verb is ſaid to be *neuter*: as, I ſleep, thou yawneſt, he ſneezes, we walk, ye run, they ſtand ſtill.

Some divide verbs neuter into, 1. Such as do not ſignify any action, but a quality; as *albet*, "it is white;" or a ſituation, as *ſedet*, "he ſits;" or have ſome relation to place; as *adeſt*, "he is preſent;" or to ſome other ſtate or attribute, as *regnat*, "he rules," &c. And, 2. Thoſe that do ſignify actions, though thoſe ſuch as do not paſs into any ſubject different from the actor; as to dine, to ſup, to play, &c.

But this latter kind ſometimes ceaſe to be *neuter*, and commence active; eſpecially in Greek and Latin, when a ſubject is given them: as, *vivere vitam, ambulare viam, pugnare pugnam*. Thus the old French poets ſay, *Soupirer ſon tourment*; the Engliſh, to *ſigh his woes*, &c.

But this is obſerved only to obtain where ſomething particular is to be expreſſed, not contained, in the verb: as, *vivere vitam beatam*, to live a happy life; *pugnare bonam pugnam*, to fight a good fight, &c.

According to the abbot de Dangeau, *verbs neuter* may be divided into *active* and *paſſive*; the firſt, thoſe that form their tenſes in Engliſh, by the auxiliary verb *to have*; in French, by *avoir*. The ſecond, thoſe that form them in Engliſh with the verb *to be*; in French *étre*.—Thus, to ſleep, to yawn, *dormir* and *eternuer*, are *neuters active*.—To come, and to arrive, are *neuters paſſive*.

NEUTRAL Salts, among chemiſts, thoſe compounded of an acid with any other ſubſtance capable of uniting with it and deſtroying its acidity. Thoſe in which the acid is ſaturated with an earth or a metal are called *imperfect*, but thoſe in which a pure alkali is employed are called *perfect* neutrals.

NEUTRALITY, the ſtate of a perſon or thing that is neuter, or that takes part with neither ſide.

NEW ABBEY, ſituated near Kilcullen bridge, in the county of Kildare, and province of Leinſter, in Ireland. It was founded by Rowland Euſtace, of a great and ancient family in this county; the tower is ſtill ſtanding, and ſome part of the abbey; the ruins of the reſt have contributed to build ſeveral dwellings near it. In the inſide Rowland Euſtace and his lady lie buried; their figures, clothed in armour, are to be ſeen there. Near this is a handſome ſeat of the Carter family, on the oppoſite ſide of the river Liffey.

NEWARK *upon Trent*, in the county of Nottingham, is a great thoroughfare in the York road, 124 miles from London. It has bridges over the Trent, which forms an iſland here, by dividing itſelf into two ſtreams two miles above the town, which meet again two miles below it. A magnificent caſtle was built here in the reign of King Stephen, which held out ſtoutly in the barons wars for King John, who died here, October 19. 1216; and it alſo ſtood out for King Charles I. to the laſt; but after he had put himſelf into the hands of the Scots army then before it. the governor by his order ſurrendered it, after which it was demoliſhed.—It was ſituated near the river; the walls of the towers are very thick, and of a very great height; and were there no hiſtorical teſtimony, theſe remains are ſufficient evidence that it was formerly of great importance. In the court before theſe ruins is a very fine bowling green, and near it a manufactory of ſacking. The town being ſubject to inundations from the river Trent, and often from that circumſtance made impaſſable, a turnpike road, at the inſtigation of a publican, was made about twenty years ago, ſo high as to be paſſed with ſafety in the greateſt floods, by arches of brick being made in ſeveral places to carry off the water, conſtructed by Mr Smeaton, at the expence of 12,000l. Near the town there is a bridge conſtructed for the ſame purpoſe, made moſtly upon dry land, conſiſting of nine arches. It has a neat though ſmall new ſtreet, and a market place that is handſome, though not very ſpacious. Its church, which is reckoned one of the fineſt in the kingdom, was built by Henry VI. and has a lofty ſpire. It was incorporated by King Charles II. with a mayor and 12 aldermen.—The ſame king, in gratitude to the town for its loyalty to his father, gave it the privilege of ſending members to parliament. It has a good trade in corn, cattle, wool, &c. and has a charity ſchool for 36 boys. Its market is on Wedneſday; fairs on the Friday before Paſſion-Sunday, May 14th, Whit-Tueſday, Auguſt 12th, Nov. 1ſt, and Monday before December 11th. Here was an abbey of Auguſtine friars. A free ſchool was founded here, endowed with the lordſhip of Everton in this county; and the vicar of Newark, and the brethren of the Trinity-guild for the time being, who were then the chief governors of this town, were made perpetual truſtees for this foundation. Many Roman urns and other antiquities have been found about this town, from whence it has been ſuppoſed that they had ſome town in the neighbourhood.

NEWBOROUGH, or NEWBURGH, in the Iſle of Angleſey, North Wales, diſtant from London 254 miles, though but a ſmall town, ſituated over againſt Caernarvon in North Wales, about 17 miles ſouthweſt.

weſt from Beaumaris; is governed by a mayor, two bailiffs, and a recorder. Its Welſh name is *Rhôſſir*, or *Rhôſvair*. Its weekly markets, which are pretty well ſupplied with proviſions, are kept on Tueſdays; and its annual fairs on the 22d of June, Aug. 10th and 21ſt, Sept. 25th, and Nov. 11th.

NEWBURG, the name of ſeveral towns of Germany, two of which are the chief towns of duchies of the ſame name; one in Bavaria, and the other in the Palatinate.

NEWBURY, a town in the county of Berks in England, 16 miles from Reading, and 56 from London, aroſe on the decay of Spinham-Land. Notwithſtanding its name ſignifies *New-Borough*, it is as old almoſt as the Conqueſt. It made ſo much broad cloth formerly, that in the reign of Henry VIII. here flouriſhed John Winſcomb, commonly called *Jack of Newbury*, one of the greateſt clothiers that ever was in England, who kept 100 looms in his houſe; and in the expedition to Flowden Field againſt the Scots, marched with 100 of his own men, all armed and clothed at his own expence; and he built all the weſt part of the church. Alſo Mr Kenric, the ſon of a clothier here, though afterwards a merchant in London, left 4000l. to the town, as well as 7500l. to Reading, to encourage the woollen manufactory. It makes a great quantity of ſhalloons and druggets, but not near ſo much broad cloth now as formerly; yet it is a flouriſhing town, with ſpacious ſtreets, and a large market place, in which is the guild-hall. The church is a good one, of ſtone, ſuppoſed to have been built about 1640. It has ſeven ſets of alms houſes. In the neighbourhood, on the banks of the Kennet, there is a ſtratum of petrified wood dug out for firing, when they frequently find trunks of large oaks yet undecayed, with petrified hazel nuts, fir cones, &c. with the bones and horns of ſtags, antelopes, &c. tuſks of boars, and heads of beavers. The river Kennet, which abounds with excellent trout, eels, and cray-fiſh, runs through the town; and here is plenty of all other proviſions. It was made a corporation by Queen Elizabeth, and is governed by a mayor, high ſteward, aldermen, &c. It ſends a great quantity of malt to London, has good inns, and has a charity-ſchool for 40 boys. Its market, which is well ſupplied with corn, is on Thurſdays; and fairs on Holy-Thurſday, July 5th, Aug. 24th, and Oct. 28th.

NEWCASTLE-*Under-Line*, a town in England, in the county of Stafford, on a branch of the Trent, is 15 miles north of Stafford, 33 ſouth ſouth-eaſt of Warrington, and 149 from London; had a caſtle, now in ruins; and is ſo called from an older caſtle, which formerly ſtood two miles off, at Cheſterton-Under-Line. It was incorporated by King Henry I, and again by Queen Elizabath and King Charles II. and is governed by a mayor, two juſtices, two bailiffs, and a common council. The clothing trade flouriſhes here; but its chief manufactory is hats, here being an incorporated company of felt makers. The ſtreets are broad and well paved, but moſt of the buildings low and thatched. The market is on Mondays; fairs Eaſter Monday, Whit-Monday, July 6th, firſt day in September, and November 6th, for cattle. Alſo a great beaſt-market every other Mon- The corporation has a court, which holds pleas for actions under 40l. Its caſtle, of which there is little to be now ſeen, was built in the reign of Henry III. It had four churches formerly, which are now reduced to one, the town having ſuffered much in the barons wars. There are frequent horſe races in the neighbourhood, though it is in a manner ſurrounded with coal pits; particularly one at Hamley-Green. It is ſofter than the cannel coal, and is cut out in ſlices; but conſumes ſo faſt, that it is only fit for forges. There is the greateſt quantity of ſtone ware made near this place of any part of England; ſo that one year with another, they are ſaid to export 20,000l. worth of it.

Newcastle, the capital of the county of Northumberland in England, 14 miles north of Durham, 94 north of York, 63 ſouth by eaſt of Berwick, 60 eaſt of Carliſle, and 271 from London, ſtands at the end of the Picts wall, on the north ſide of the Tyne, over which it has a ſtately bridge into the biſhopric of Durham, in which its ſuburb called *Gateſide* is ſituated; for the liberties of Newcaſtle extend no farther than the great iron gate upon the bridge, which has the arms of the biſhop of Durham carved on the eaſt ſide and thoſe of Newcaſtle on the weſt ſide. It is admitted to have been a Roman ſtation, though no evidence at preſent appears, except at Pandon-gate, whoſe ſuperſtructure is of different workmanſhip and model from any others of the town, the arches being circular. The Carpenter's tower is alſo of Roman original. In the Saxons time it was called *Moncaſter*, from the monks here, who all fled when it was depopulated by the Danes; and afterwards *Newcaſtle*, from a caſtle built here by William the Conqueror's ſon, Robert, in 1080, to defend the country againſt the Scots, whoſe kings had this town before the Norman conqueſt, and ſometimes reſided here.—Several monaſteries and houſes were built here ſoon after the caſtle; and it was greatly enlarged and enriched by a good trade to the coaſts of Germany, and by the ſale of its coal to other parts of England; for which, and for other merchandiſe, it is become the great emporium of the north of England, it being the neateſt and largeſt [illegible] thoſe parts, next to York. In the reign of Edward I. it was burnt by the Scots; but a very rich burgher who was taken priſoner, ſoon ranſomed himſelf for a good ſum of money, and began the firſt fortifications of the place, which he extended from Sand-gate to Pampedon, and thence to the Auſtin friars gate; which the townſmen finiſhed, and encompaſſed with ſtout walls, which extended two miles, wherein are ſeven gates and many turrets, with ſeveral caſements bomb-proof. To which two other gates were added in more modern times, viz. Bridge-gate and Sand-gate: the wall between them was afterwards removed to open the quay. Edward III. granted the corporation the duties and cuſtoms of the town for ſeven years, to enable them to complete the fortification. It is a borough at leaſt as ancient as King Richard II. who granted that a ſword ſhould be carried before the mayor; and King Henry VI. made it a town and county incorporate of itſelf, independent of Northumberland. Henry VII. built a monaſtery here for the Franciſcans. Beſides which, it had ſeveral religious foundations, ſeveral of which ſtructures have been converted to companies halls and private reſidences. In the reign of Henry VIII. this place is ſaid to have exceeded in the ſtrength and magnificence of its works all the cities of England, and moſt places in Europe. The town is governed by a mayor, 12 aldermen, a recorder, ſheriff, town clerk, a clerk of the chambers, two coroners, eight chamberlains, a ſword bearer, a water bailiff, and ſeven ſerjeants at mace. Its ſituation, eſpecially the moſt buſy part of it towards the river, is very uneven, it being built on the declivity of a ſteep hill, and the houſes very cloſe. The caſtle overlooks the whole town. That part built by Robert was of great ſtrength, and ſquare, and ſurrounded by two walls; the ſquare was 62 feet by 54, and the walls 13 feet thick, within which was a chapel. The outward fortifications are now defaced, and their ſite crowded with buildings. The tower remains entire, and ſituated on a lofty eminence, and its principal entrance is to the ſouth. This caſtle belongs to the county, and makes no part of the liberties.—It is now the county priſon, and in the great hall the judges hold the aſſizes. Here Baliol king of Scotland did homage to King Edward I. in 1292; as did Edward Baliol in 1334 to King Edward III. Here is a magnificent exchange and a cuſtomhouſe; and the fineſt quay in England, except that at Yarmouth, being 700 yards long, it being far more ſpacious and longer than thoſe at London or Briſtol, though not equal to either for buſineſs. There is a handſome manſion houſe for the mayor, who is allowed 1000l. a-year for his table, beſides a coach and barge. The old bridge was carried away in a flood, and the preſent was erected about 1775, of nine noble elliptic arches. With the old bridge 22 houſes were thrown down, and ſix lives loſt. It was originally built of wood; but having been deſtroyed by fire in 1248, was rebuilt of ſtone, and conſiſted of 12 arches, three of which on the north ſide were cloſed up, and ſerved for cellars; this was again rebuilt about 1450, and was crowded with wooden buildings; but near the middle was a tower with an iron gate, uſed as a town priſon. A ſtrong building croſſed the bridge, which was uſed as a magazine. On the ſouth front was a ſtatue of King Charles II. [illegible]er which deſtroyed this bridge, on November 11. 1771, was upwards of 12 feet above high water mark in ſpring tides.—On deſtroying the ruinated piers of the old bridge to erect the preſent, by obſervations made, and medals found, part of it is ſuppoſed to have exiſted from the time of the Romans. It is computed that above 6000 keelmen are employed here, who have formed themſelves into a friendly ſociety; and, by their own contributions, built a noble hoſpital containing 50 chambers, for ſuch of their fraternity as are poor, diſabled, or paſt their labour; and it is ſupported by the contribution of thoſe that are in health. The town is extremely populous; and, notwithſtanding the multitude of thoſe employed in and about the coal pits, with which the town is in a manner ſurrounded, has abundance of poor; but it has alſo many wealthy inhabitants, and it is ſaid they pay above 4000l. a-year to their relief. It is obſerved, that this town has the greateſt public revenue in its own right as a corporation, of any town in England, it being computed at no leſs than 8000l. a-year. In 1774, the receipts of the corporation were 20,360l. 9s. 8d.; and their diſburſements about 19,445l. The number of inhabitants far exceeds 30,000. Here are four churches or chapels. That of St Nicholas is the mother church, a curious fabric, built cathedral-wiſe by David king of Scots, 240 feet long, 75 broad, and proportionably high, with a tower ſteeple 194 feet in height, of Gothic architecture; alſo St Andrew's, St John's, and All Saints, lately rebuilt on the ſite of the old ſtructure, of a circular form. Here are alſo ſeveral meeting houſes, and four charity ſchools for 300 children; a fine hall for the ſurgeons, and a large priſon called *Newgate;* alſo an hoſpital for lunatics, another for the lying-in of married women, as well as a fund raiſed for the relief of thoſe who are delivered at their own houſes. Here is a well endowed and large infirmary, and an aſſembly room that attracts attention, containing every uſeful apartment, and a ball-room 93 feet by 40: The front is ornamented with ſix Ionic pillars, &c. In another part of the town is a new theatre. Here is a very neat ſet of baths. A free grammar ſchool was granted by James I. from an old foundation of St Mary's hoſpital, in the veſtry room of whoſe chapel is the election of the officers of the corporation. There were formerly ſeveral palaces in this city, viz. Pampedon hall, Lumley place, Earl's place, Northumberland houſe, Weſtmoreland place, &c. The free maſons have lately erected an elegant hall, richly ornamented, to hold their lodge in, near High friar chair, capable of holding above 4000 of that ancient fraternity. Here is an hoſpital for 39 decayed freemen and their widows; and another for three clergymen's widows and three merchants widows. The Maiden's hoſpital, built in 1753, is endowed with 2400l. for ſix maiden women and ſix poor men. Dr Thomlin, a prebendary of St Paul's, and rector of Whicham in the biſhopric of Durham, lately gave a library of above 6000 valuable books to the corporation, and ſettled a rent charge of 5l. a-year for ever for buying new ones; and Walter Blacket, Eſq; one of its repreſentatives in parliament, built a neat repoſitory for them, and ſettled 25l. a-year for ever on a librarian. The upper or north part of the town, inhabited by the politer ſort of people, is much pleaſanter than that part next the river, and has three level, well built, and ſpacious ſtreets. The river all the way up from Shields to Newcaſtle is broad, the channel ſafe, and the tide flows with a ſtrong current to the town, and far beyond it. In the beginning of the late civil wars, this town was taken and plundered by the *Scotch fanatics*, who here ſold their king, Charles I. for 200,000l. in hand, and ſecurity for as much more. The glaſs works are very curious, and have more buſineſs of the fine ſort than moſt other places. Beſides, it has a conſiderable manufacture of broad and narrow cloths, and ſeveral ſoap boileries; and this place is famous for grindſtones, for which there is ſuch a demand, that ſcarce a ſhip ſtirs without them; from whence came the proverb, "That a Scotſman and a Newcaſtle grindſtone travel all the world over." Ships fit for the coal trade are built here to perfection, with great ſtrength. Here is a conſiderable manufactory of hardware and wrought iron, after the manner of that at Sheffield.—Its markets are on Tueſdays and Saturdays. Its fairs in Auguſt, which laſt nine days, and October 29th, which laſt nine days. By an act of Queen Mary, the price of the carriage of goods hither from London by waggons was ſettled at 2d. per lb. London alone is ſaid to conſume at leaſt 766,887 chaldrons of its coal every year: but as for the fiſh vended in that city by the name of *Newcaſtle ſalmon*, it is more properly called *Berwick ſalmon*, the freſh ſalmon being taken near 50 miles farther, as far as the Tweed, and brought on the backs of horſes to Shields, where it is cured, pickled, and ſent on board for London. It is worth remembering, that at the aſſizes here in 1743, two old men were ſubpœna'd hither as witneſſes from a neighbouring village, viz. one 135 years of age, and his ſon 95, both hearty, and having their ſight and hearing; and that in 1744, one Adam Turnbull died in this town aged 112, who had had four wives, the laſt of whom he had married when he was near 100 years old.

The annual amount of the revenue of cuſtoms at this port, which Mr Brand in his Hiſtory of Newcaſtle ſtates at 41,000l. is now very conſiderably upwards of 70,000l.

The coals carried out of it annually (on an average from 1785 to 1791) were nearly 448,000 Newcaſtle chaldrons; the weight of which is 1,187,200 tons.

The manufacture of earthen ware is greatly increaſed, and carried on to great perfection in its neighbourhood, in ſeven potteries; and their produce exported hence to foreign parts, as well as to the different ports of this kingdom; ſome of which potteries conſtantly employ upwards of 100 perſons, men, women, and children.

New works of conſiderable extent for the manufacture of iron have been eſtabliſhed; as alſo a very capital manufactory for white lead, milled lead, &c.

The trade with the Weſt India iſlands is increaſing, and may in time become very conſiderable; as the port has great advantages, in being able to ſupply on the cheapeſt terms many articles wanted in thoſe iſlands; ſuch as coals, grindſtones, lime, bricks, tiles, iron wares, &c.; and is moſt advantageouſly ſituated for the re-exportation of the Weſt India produce to the ports on the Baltic, to Germany, the United Provinces, Flanders, and part of France; and moreover, the riſk of navigation, and the rate of inſurance, not being greater than between thoſe iſlands and Liverpool, and ſome other ports on the weſtern coaſt of this kingdom.

The town of Newcaſtle is daily increaſing in its population and opulence; and it would be well if it could not be added, in luxury, the almoſt neceſſary conſequence of riches: but it ſhould not be omitted, that it is noted for hoſpitality and good living.

Great improvements have been made in the town, by opening new ſtreets, and paving the principal ones, in the ſame manner as in London. It cannot be ſaid that it is well lighted, the few lamps ſcattered here and there ſerving but to make darkneſs viſible; nor have the orders repeatedly given by the magiſtrates for cleaning the ſtreets been attended with the full deſired effect.

To the liſt of public edifices of modern erection, and mentioned above, viz. the grand aſſembly rooms, and the elegant theatre, which were built by ſubſcription, and the ſuperb pariſh church of All Saints, built at a very great expence by the pariſhioners, may be added a commodious riding houſe, built alſo by ſubſcription.

Newcastle, a borough town of Ireland, in the county of Dublin, and province of Leinſter, which returns two members to parliament, and holds two fairs, 9th of May and 8th of October.

Newcastle is alſo the name of a handſome town in the county of Limerick and province of Munſter, on the high road to Kerry, 114 miles from Dublin. Here was a religious houſe poſſeſſed by the knights templars. It is ſaid, they uſed ſome barbarous cuſtoms which greatly diſguſted the Iriſh, who, watching a favourable opportunity, attacked a number of the knights riding out together and put them to death; the place is ſtill remembered where their remains were interred. This order was ſuppreſſed in the famous council of Vienna, 22d of March 1312. Newcaſtle conſiſts of a large ſquare where markets and fairs are held; on the northern ſide ſtands a market houſe, with an aſſembly room; on the ſouth ſide is the church, which is the neateſt in the county, and it was finiſhed in 1777 at the ſole expence of Lord Courtenay. It ſtands cloſe to the walls and fortifications of the knights templars, of which one of the caſtles is fitted up for Lord Courtenay's agent.

Newcastle, a ſmall town in America, 35 miles below Philadelphia, on the weſt bank of Delaware river. It was firſt ſettled by the Swedes about the year 1627, and called *Stockholm*. It was afterwards taken by the Dutch, and called *New Amſterdam*. When it fell into the hands of the Engliſh, it was called by its preſent name. It contains about 60 houſes, which have the aſpect of decay, and was formerly the ſeat of government. This is the firſt town that was ſettled on Delaware river.

Newcastle (Duke of). See **Cavendish**.

New England. See *England* (*New*.)

New Foreſt of Hampſhire in England, is a tract of at leaſt 40 miles in compaſs, which had many populous towns and villages, and 36 mother churches, till it was deſtroyed and turned into a foreſt by William the Conqueror. There are nine walks in it; and to every one a keeper, under a lord warden, beſides two rangers, and a bow-bearer. As this large tract lay many ages open and expoſed to invaſions from foreigners, King Henry VIII. built ſome caſtles in it; and it has now ſeveral pretty towns and villages. It is ſituated in that part of Hampſhire which is bounded on the eaſt by Southampton river, and on the ſouth by the Britiſh Channel. It poſſeſſes advantages of ſituation, with reſpect to the convenience of water carriage and nearneſs to the dock yards, ſuperior to every other foreſt, having in its neighbourhood ſeveral ports and places of ſhelter for ſhipping timber, among which Lymington is at the diſtance of only two miles, Bewley about half a mile, and Redbridge three or four miles from the foreſt; and the navigation to Portſmouth, the moſt conſiderable dock yard in this kingdom, is only about 30 miles from the neareſt of thoſe places. This is the only foreſt belonging to the crown of which the origin is known. Doomſday-book contains the moſt diſtinct account of its afforeſtation by William the Conqueror: the contents of every

every field, farm, or eſtate afforeſted, in hides, carucates, or virgates, by which the extent of land was then computed, together with the names of the hundreds and villages, and of the former proprietors (which are for the moſt part Saxon), the rent or yearly value of each poſſeſſion, and the tax which had been paid for it to the crown during the reign of Edward the Confeſſor, before the inhabitants were expelled, and that part of the country laid waſte, are all to be found in that moſt curious and venerable record. Wiſhing to diſcover the original extent of the foreſt, we extracted, for our own information, all that relates to it in that ancient ſurvey. The extract is far too voluminous for inſertion. The names of many of the places having been changed ſince that time, it is difficult to aſcertain with preciſion what were then the limits of the foreſt. The oldeſt perambulation we have met with is among the Pleas of the Foreſt, in the eighth year of King Edward I. preſerved in the Chapter-houſe at Weſtminſter. The boundaries there deſcribed include all the country from Southampton river on the eaſt to the Avon on the weſt, following the ſea coaſt as far as the ſouthern boundary between thoſe rivers, and extending northwards as far as North Chadeford, or North Charford, on the weſt, and to Wade and Orebrugg, or Owerbridge, on the eaſt; and the greateſt part, if not the whole, of that extenſive diſtrict, is mentioned in Doomſday book to be the foreſt belonging to the crown. Another perambulation was however made in the 29th of the ſame king, which leaves out a great part of the country contained within the former. This perambulation, which is preſerved in the tower of London, confines the foreſt to limits which, as far as we can trace them, appear to have been followed in the 22d year of Charles II. when the foreſt was again perambulated. By the *Charta de Foreſta*, all lands not belonging to the crown which had been afforeſted by Henry II. Richard I. or King John, were to be diſafforeſted; but as no proviſion was made for the reduction of the more ancient afforeſtations, it is eaſy to account for the great diminution of this foreſt in the reign of Edward I. who was not a prince likely to ſubmit to any encroachment on his rights. The perambulation of the 22d of Charles II. is the laſt which we find on record: it contains the preſent legal bounds of the foreſt, and was given to the ſurveyors as their guide, in taking the plan which they have made lately by direction. From that plan, with the approbation of the lords commiſſioners of his majeſty's treaſury, an engraving was made. According to the laſt-mentioned perambulation and the plan, the foreſt extends from Godſhill on the north-weſt to the ſea on the ſouth-eaſt, about 20 miles; and from Hardley on the eaſt to Ringwood on the weſt, about 15 miles; and contains within thoſe limits about 92,365 acres ſtatute meaſure. The whole of that quantity, however, is not foreſt land, or now the property of the crown: there are ſeveral manors and other conſiderable freehold eſtates within the perambulation, belonging to individuals, to the amount of about 24,797 acres; about 625 acres are copyhold or cuſtomary lands belonging to his majeſty's manor of Lyndhurſt; about 1004 acres are leaſe-hold under the crown, granted for certain terms of years, and forming part of the demiſed land revenue, under the management of the ſurveyor-general of crown lands; about 901 acres are purpreſtures or encroachments on the foreſt; about 1193 acres more are encloſed lands held by the maſter-keepers and groom-keepers, with their reſpective lodges; and the remainder, being about 63,845 acres, are woods and waſte lands of the foreſt. To perpetuate the ſpot where William Rufus was killed by the glance of an arrow ſhot at a ſtag, a triangular ſtone was erected in 1745. George III. viſited this ſpot in 1789. In Auguſt 1782, a curious ancient golden croſs was found here by a labouring man digging turf. It weighed above an ounce of gold, and had on one ſide an engraving of our Saviour, and on the other, the ladder, ſpear, nails, and other emblems of his ſufferings.

New Holland. See HOLLAND (*New*).

New York. See YORK (*New*).

New Zealand. See ZEALAND (*New*).

New Years Gifts. Preſents made on the firſt day of the new year. Nonius Marcellus refers the origin of this cuſtom among the Romans to Tatius king of the Sabines, who reigned at Rome conjointly with Romulus, and who having conſidered as a good omen a preſent of ſome branches cut in a wood conſecrated to *Strenia*, the goddeſs of ſtrength, which he received on the firſt day of the new year, authorized this cuſtom afterwards, and gave to theſe preſents the name of *ſtrena*. However this may be, the Romans on that day celebrated a feſtival in honour of Janus, and paid their reſpects at the ſame time to Juno; but they did not paſs it in idleneſs, leſt they ſhould become indolent during the reſt of the year. They ſent preſents to one another of figs, dates, honey, &c. to ſhow their friends that they wiſhed for a happy and agreeable life. Clients, that is to ſay, thoſe who were under the protection of the great, carried preſents of this kind to their patrons, adding to them a ſmall piece of ſilver. Under Auguſtus, the ſenate, the knights, and the people, preſented ſuch gifts to him, and in his abſence depoſited them in the capitol. Of the ſucceeding princes ſome adopted this cuſtom and others aboliſhed it; but it always continued among the people. The early Chriſtians condemned it, becauſe it appeared to be a relick of Paganiſm and a ſpecies of ſuperſtition; but when it began to have no other object than that of being a mark of veneration and eſteem, the church ceaſed to diſapprove of it.

NEWEL, in architecture, is the upright poſt which a pair of winding ſtairs turn about; this is properly a cylinder of ſtone, which bears on the ground, and is formed by the end of the ſteps of the winding ſtairs.

NEWFIDLER-SEA, a lake in Hungary, 17 miles in length and 6 in breadth.

NEWFOUNDLAND, a large iſland of North America, belonging to Great Britain, lying between 46. 50. and 51. 30. N. Lat. and between 53. 30. and 58. 20. W. Long. from London. The form is that of an irregular triangle, the baſe or ſouth ſide being 80 leagues in extent; the eaſt ſide is the longeſt; and the whole circumference about 150 leagues. It is bounded on the north by the ſtraits of Belleiſle, which ſeparate it from Labrador; on the eaſt and

Newfoundland.

Newfoundland.

ſouth it hath the Atlantic ocean, and on the weſt the gulf of St Lawrence. The climate is rather ſevere; and the ſoil, at leaſt on the ſea coaſt, which is all that we know of it, is poor and barren. A few kitchen vegetables with ſtrawberries and raſpberries are all its produce. The country within land is mountainous, and abounds with timber; there are ſeveral rivers which are plentifully ſtored with various ſorts of fiſh, abundance of deep bays, and many good ports. St John's and Placentia are the two principal ſettlements, and at each of theſe there is a fort; the number of people who remain here in the winter hath been computed at 4000. The French, by the treaty of Utrecht, were permitted to fiſh from Cape Bonaviſta on the eaſt ſide round the north of the iſland to Point Rich on the weſt; and by the treaty of Paris, they are allowed the iſles of St Pierre and Miquelon, upon which they are to dry their fiſh, but not to erect fortifications of any kind.

The great importance of this place ariſes from its fiſhery, which is in part carried on by the inhabitants at the ſeveral harbours, which are about 20 in number, who take vaſt quantities of cod near the coaſt, which they bring in and cure at their leiſure, in order to have it ready for the ſhips when they arrive. But the great and extenſive fiſhery is on the banks at ſome diſtance from the iſland. The great bank lies 20 leagues from the neareſt point of land from the latitude 41° to 49°, ſtretching 300 miles in length and 75 in breadth.—To the eaſt of this lies the Falſe Bank; the next is ſtyled *Vert* or *the Green Bank*, about 240 miles long, and 120 over; then Banquero, about the ſame ſize; the ſhoals of Sand Iſland, Whale Bank, and the Bank of St Peter's, with ſeveral others of leſs note, all abounding with fiſh.

The cod are caught only by a hook; and an expert fiſher will take from 150 to 300 and upwards in a day; for the fiſh never bite in the night, and the labour is very great. The ſeaſon is from May to October, in the height of which there are from 500 to 700 ſail upon the banks at a time. The fiſh caught in the ſpring months are beſt; they are cured in very different ways. Some are ſtyled *white fiſh*, others *mud fiſh*, which are ſtowed and ſalted in the hold, and will not keep long; but the beſt and moſt valuable are the dried cod. The quantity taken is prodigious: yet in ſome ſeaſons and in different places varies conſiderably, as the fiſh frequently change their ſtations. The *fiſhing ſhips*, as they are called, lie upon the banks, with the help of their boats take and cure their own fiſh, and as ſoon as they are full ſail for a market. The ſack ſhips proceed directly to the iſland, where they purchaſe fiſh from the inhabitants either by barter or bills of exchange. The principal markets for cod are Spain, Portugal, Italy, and the Weſt Indies. The value of this fiſhery is computed at ſome hundred thouſand pounds annually; employing, beſides ſeveral hundred ſhips, ſome thouſands of ſeamen, and affording a maintenance to a number of tradeſmen of different occupations, by which many large towns on the weſt ſide of England accumulate much wealth, and at the ſame time contribute in many reſpects to the benefit of the public.

The great utility of this fiſhery was very early ſeen, and very vigorouſly purſued; for in the beginning of the reign of King James I. we had two hundred and fifty ſail employed therein. It is computed, that three quintals of wet fiſh make one quintal of dried cod. Beſides, the livers of every hundred quintals make a hogſhead of oil; and excluſive of theſe there are many leſſer advantages that go in diminution of the expence. The fiſhery, as we have ſaid above, produces differently in different ſeaſons; but it is judged to be a very good one when it produces 300,000 quintals of fiſh and 3000 barrels of oil, both equally ſaleable and valuable commodities. As every ſhip carries twelve, and each of their boats eight men, and as theſe return home in ſix months there cannot be a more noble nurſery for ſeamen. The artificers and traders employed in building, victualling, and repairing theſe veſſels, are very numerous in the reſpective ports from which they ſail. Theſe circumſtances juſtify the particular attention paid by government to this branch of the public ſervice; in reſpect to which that they may be well informed, an annual and very diſtinct account, by which the whole is ſeen at one view, is delivered by the proper officer to the governor of Newfoundland, that is, to the commodore of his majeſty's ſquadron. Mr Pennant, in the appendix to his Arctic Zoology, gives us, from what appears to be very good authority, the following account of this iſland.

" Within the circuit of 60 miles of the ſouthern part, the country is hilly, but not mountainous. The hills increaſe in height as they recede from the ſea; their courſe is irregular, not forming a chain of hills, but riſing and falling abruptly. The coaſts are high, and the ſhores moſt remarkably bold. The ſame may be ſaid of almoſt every part of this vaſt iſland. The country is much wooded, and the hills (ſuch as have not flat tops to admit the rain to ſtagnate on them) are clothed with birch, with hazel, ſpruce, fir, and pine, all ſmall; which is chiefly owing to the inhabitants taking off the bark to cover the fiſh ſtages. This peninſula is ſo indented by the fine and deep bays of Placentia, St Mary, Conception, and Trinity, that it may be eaſily penetrated in all parts, which is done for the ſake of fowling, or the procuring of ſpars for maſts, oars, &c. The iſland is on all ſides more or leſs pierced with deep bays, which peninſulate it in many places by iſthmuſes moſt remarkably narrow.—The mountains on the ſouth-weſt ſide, near the ſea, are very high, and terminate in lofty headlands; ſuch are Chapeau Rouge, a moſt remarkably high promontory, Cape St Mary's, and Cape le Hune. Such in general is the formation of the iſland; on the north-eaſt, moſt of the hills in the interior part of the country terminate pyramidally, but form no chain. The interior parts of the country conſiſt chiefly of moraſſes, or dry barren hammocks, or level land, with frequent lakes or ponds, and in ſome places covered with ſtunted black ſpruce. The rivers of Newfoundland are unfit for navigation, but they are of uſe in floating down the wood with the ſummer floods. Still the rivers and the brooks are excellent guides for the hunters of beavers and other animals, to penetrate up the country, which as yet has never been done deeper than 30 miles. Near the brooks it is that timber is commonly met with, but ſeldom above three or four miles inland, and in valleys; the hills in the northern diſtrict being naked and barren.

" In ſome parts of Newfoundland there is timber ſufficiently large for the building of merchant ſhips: the hulk is made of juniper, and the pine furniſhes maſts and yards; but as yet none has been found large enough for a maſt for a large cutter. The fiſhery is divided into two ſeaſons; that on the ſhore, or the ſhore ſeaſon, commences about the 20th of April, and ends about the 10th of October; the boats fiſh in from four to 20 fathoms of water. The moſt important, the bank fiſhing ſeaſon, begins the 10th of May, and continues till the laſt of September, and is carried on in 30 to 45 fathoms depth of water. Banking veſſels have ſailed from St John's to the bank as early as the 12th of April. At firſt they uſe pork or birds for a bait; but as they catch fiſh, they ſupply themſelves with a ſhell fiſh called clams, which is found in the belly of the cod. The next bait is the lobſter; after that the herring and the launce, which laſt till June, when the capelan comes on the coaſt, and is another bait. In Auguſt the ſquid comes into uſe, and finally the herring again. The greateſt number of cod fiſh taken by a ſingle fiſherman in the ſeaſon has been 12,000, but the average is 7000. The largeſt fiſh which has been taken was four feet three inches long, and weighed 46 pounds. A banking veſſel of 10,000 fiſh ought to be filled in three weeks, and ſo in proportion; and 80 quintals (112 lb. each) for a boat in the ſame time.

"In 1785, 541 Engliſh veſſels fiſhed on the bank, a number exceeding that of the French. A heap of dried fiſh, 20 feet long and ten wide, and four deep, contains 900 quintals. Such a heap ſettles, in the courſe of 48 hours after it is made, about $\frac{1}{11}$. An extraordinary ſplitter will ſplit five quintals of fiſh in an hour. The average in that time is two. There is no fiſhing during winter, on account of the inclemency of the ſeaſon. It is ſuppoſed that the fiſh in a great meaſure quit the banks before that time, as in general they are very ſcarce when the fiſhing veſſels go upon the banks early in the ſpring.

"There are a few ſmall towns on the coaſts, which have gardens ſown with Engliſh pulſe; but many of the inhabitants quit the country in winter.

"An admiral or ſome ſea officer is governor of Newfoundland. He ſails from England in May, and returns by the 30th of November."

NEWMARKET, in Cambridgeſhire, 13 miles from Cambridge, 13 from St Edmundſbury, and 60 from London, is a town with one long ſtreet, the north ſide in Suffolk, the ſouth ſide in Cambridgeſhire. It is a healthy place, and a great thoroughfare in the road from London to Norfolk; but ſtands moſtly by the horſe races every year in April and October, here being the fineſt courſe in England; on which there is a houſe for the king when he comes to the races, which was built by Charles II. The king gives a plate or two every year, beſides thoſe given by the nobility; and wagers are laid upon the horſes, which are ſeldom under 500l. and often above 1000l. Here are two coffeehouſes, at which, every night and morning during the races, there is gaming, as there is alſo at the houſes of the nobility and gentry. Here are alſo cock matches. Here is a little chapel, which is a chapel of eaſe to the mother church at Ditton; and another in the Suffolk ſide, which is parochial. The town was burnt in 1683, but ſoon rebuilt. Here are two charity ſchools, one for 20 boy another for 20 girls, ſupported by 50l. a-year, firſt ſettled by Queen Anne. Here is a market on Tueſdays and Thurſdays, and fairs on October 28. and Whitſun-Tueſday.

NEWROSS, a borough town in the county of Wexford, and province of Leinſter, in Ireland, 67 miles from Dublin. It returns two members to parliament; the patronage is in the families of Tottenham and Leigh. This town was formerly walled, and ſome of the gates ſtill remain. It lies on the river Barrow, which is here very deep, and ſhips of burden can come up to the quay even when the tide is out. The church is large, but the cuſtomhouſe and quay are both ſmall, and ſometimes overflooded many feet. It is one of the ſtaple ports for exporting wool, yet its trade is but inconſiderable; beef and butter are the principal articles exported. Here is a barrack for a troop of horſe, and a good ferry into the county of Kilkenny. Near this town is a charter ſchool. It is alſo a poſt town, and gives title of earl to the family of Gore. It was formerly fortified, and adorned with many religious houſes, among which was a crouched friary, built on the ſummit of a hill in the town; but one of the friars having killed a principal inhabitant, the whole body of the people aroſe, put the friars to death, and totally deſtroyed the friary; on the ſite of which the monaſtery of St Saviour, for conventual Franciſcans, was afterwards erected by Sir John Devereux; and the eaſt end of this laſt building is now the pariſh church. A friary for Eremites, following the rule of St Auguſtine, was alſo founded here in the reign of Edward III.

NEWSPAPERS, periodical publications, daily, weekly, &c. for the purpoſe of communicating to the world every thing of importance, whether political or literary, &c. which is going on. They have tended much to the diſſemination of learning, and have ſerved many other valuable purpoſes; and while they are carried on with candour, impartiality, and ability, they are unqueſtionably a great national benefit. W this, however, is not the caſe, and it often happens, they diſgrace their authors, and are highly injurious to the public. They were firſt publiſhed in England, Auguſt 22. 1642. *Journal des Sçavans*, a French paper, was firſt publiſhed in 1665, though one was printed in England, under the title of the *Public Intelligencer*, by Sir Roger L'Eſtrange, 1663, which he dropped, on the publication of the firſt London Gazette. Newſpapers and pamphlets were prohibited by royal proclamation 1680. Though at the Revolution prohibitions of this kind were done away, and the preſs ſet at liberty, yet newſpapers were afterwards made objects of taxation, and for this purpoſe were firſt ſtamped 1713. The number of them, however, gradually increaſed; and there were printed in the whole kingdom during the years 1775, 12,680,000; 1776, 12,830,000; 1777, 13,150,642; 1778, 13,240,059; 1779, 14,106,842 1780, 14,217,371; 1781, 14,397,620; 1782, 15,272,519. They are now ſtill more numerous.

NEW Style, firſt uſed in England in 1753, was introduced into the weſtern world by Pope Gregory XIII. See Chronology, N° 24.

NEWT, or EFT, in zoology, the common lizard. See LACERTA.

NEWTON (Sir Iſaac), one of the greateſt philoſophers and mathematicians the world has ever produced, was the only child of Mr John Newton of Colesworth, not far from Grantham in Lincolnſhire, who had an eſtate of about 120l. *per annum*, which he kept in his own hands. He was born at that place on Chriſtmas day 1642. His father dying when he was young, his mother's brother, a clergyman of the name of *Ayſcough*, or *Aſkew*, who lived near her, and directed all her affairs after the death of Mr Newton, put her ſon to ſchool at Grantham. When he had finiſhed his ſchool learning, his mother took him home, intending, as ſhe had no other child, to have the pleaſure of his company; and that he, as his father had done, ſhould occupy his own eſtate. But his uncle happening to find him in a hay loft at Grantham working a mathematical problem, and having otherwiſe obſerved the boy's mind to be uncommonly bent upon learning, he prevailed upon her to part with him; and ſhe ſent him to Trinity College in Cambridge, where her brother, having himſelf been a member of it, had ſtill many friends. Iſaac was ſoon taken notice of by Dr Iſaac Barrow; who, obſerving his bright genius, contracted a great friendſhip for him. M. de Fontenelle tells us, "That in learning mathematics he did not ſtudy Euclid, who ſeemed to him too plain and ſimple, and unworthy of taking up his time. He underſtood him almoſt before he read him; and a caſt of his eye upon the contents of his theorems was ſufficient to make him maſter of them. He advanced at once to the geometry of Des Cartes, Kepler's Optics, &c. It is certain that he had made his great diſcoveries in geometry, and laid the foundation of his two famous works the *Principia* and the *Optics*, by the time he was 24 years of age."

In 1664, he took the degree of bachelor of arts; and in 1668 that of maſter, being elected the year before, fellow of his college. He had before this time diſcovered the method of fluxions; and in 1669 he was choſen profeſſor of mathematics in the univerſity of Cambridge, upon the reſignation of Dr Barrow. The ſame year, and the two following, he read a courſe of optical lectures in Latin, in the public ſchools of the univerſity; an Engliſh tranſlation of which was printed at London in 1728, in 8vo, as was the Latin original the next year in 4to. From the year 1671 to 1679, he held a correſpondence by letters with Mr Henry Oldenburg ſecretary of the Royal Society, and Mr John Collins fellow of that ſociety; which letters contain a variety of curious obſervations.

Concerning the origin of his diſcoveries, we are told, that as he ſat alone in a garden, the falling of ſome apples from a tree led him into a ſpeculation on the power of gravity; that as this power is not diminiſhed at the remoteſt diſtance from the centre of the earth to which we can riſe, it appeared to him reaſonable to conclude, that it muſt extend much farther than was uſually thought; and purſuing this ſpeculation, by comparing the periods of the ſeveral planets with their diſtances from the ſun, he found, that if any power like gravity held them in their courſes, its ſtrength muſt decreaſe in the duplicate proportion of the increaſe of diſtance. This inquiry was dropped; but reſumed again, and gave riſe to his writing the treatiſe which he publiſhed in 1687, under the name of *Mathematical Principles of Natural Philoſophy*; a work looked upon as the production of a celeſtial intelligence rather than of a man. The very ſame year in which this great work was publiſhed, the univerſity of Cambridge was attacked by King James II. when Mr Newton was one of its moſt zealous defenders, and was accordingly nominated one of the delegates of that univerſity to the high-commiſſion court; and the next year he was choſen one of their members for the convention parliament, in which he ſat till it was diſſolved. In 1696, Mr Montague, then chancellor of the exchequer, and afterwards earl of Halifax, obtained for him of the king the office of warden of the mint; in which employment he was of ſignal ſervice, when the money was called in to be recoined. Three years after, he was appointed maſter of the mint; a place of very conſiderable profit, which he held till his death. In 1699, he was elected one of the members of the Royal Academy of Sciences at Paris. In 1701, he was a ſecond time choſen member of parliament for the univerſity of Cambridge. In 1704, he publiſhed his *Optics*; which is a piece of philoſophy ſo new, that the ſcience may be conſidered as entirely indebted to our author. In 1705, he was knighted by Queen Anne. In 1707, he publiſhed his *Arithmetica Univerſalis*. In 1711, his *Analyſis per Quantitatum Series, Fluxiones et Differentias*, &c. was publiſhed by William Jones, Eſq. In 1712, ſeveral letters of his were publiſhed in the *Commercium Epiſtolicum*. In the reign of George I. he was better known at court than before. The princeſs of Wales, afterwards queen conſort of England, uſed frequently to propoſe queſtions to him, and to declare that ſhe thought herſelf happy to live at the ſame time with him, and have the pleaſure and advantages of his converſation. He had written a treatiſe of ancient chronology, which he did not think of publiſhing; but the princeſs deſired an abſtract, which ſhe would never part with. However, a copy of it ſtole abroad, and was carried into France; where it was tranſlated and printed, with ſome obſervations, which were afterwards anſwered by Sir Iſaac. But, in 1728, the Chronology itſelf was publiſhed at London in quarto; and was attacked by ſeveral perſons, and as zealouſly defended by Sir Iſaac's friends. The main deſign of it was to find out, from ſome tracts of the moſt ancient Greek aſtronomy, what was the poſition of the colures with reſpect to the fixed ſtars, in the time of Chiron the centaur. As it is now known that theſe ſtars have a motion in longitude of one degree in 72 years, if it is once known through what fixed ſtars the colure paſſed in Chiron's time, by taking the diſtance of theſe ſtars from thoſe through which it now paſſes, we might determine what number of years is elapſed ſince Chiron's time. As Chiron was one of the Argonauts, this would fix the time of that famous expedition, and conſequently that of the Trojan war; the two great events upon which all the ancient chronology depends. Sir Iſaac places them 500 years nearer the birth of Chriſt than other chronologers generally do.

This great man had all along enjoyed a ſettled and equal ſtate of health to the age of 80, when he began to be afflicted with an incontinence of urine. However, for the five following years, he had great intervals of eaſe, which he procured by the obſervance of a ſtrict regimen. It was then believed that he certainly had the ſtone; and when the paroxyſms were ſo violent, that large drops of ſweat ran down his face, he never uttered the leaſt complaint, or expreſſed the ſmalleſt degree of impatience; but, as ſoon as he had a moment's eaſe, would ſmile and talk with his uſual cheerfulneſs. Till then he always read and wrote ſeveral hours in a day. He had the perfect uſe of all his ſenſes and underſtanding till the day before he died, which was on the 20th of March 1726-7 in the 85th year of his age. He lay in ſtate in the Jeruſalem chamber at Weſtminiſter, and on the 28th of March his body was conveyed into Weſtminſter abbey; the pall being ſupported by the lord chancellor, the dukes of Montroſe and Roxburgh, and the earls of Pembroke, Suſſex, and Macclesfield. The biſhop of Rocheſter read the funeral office, being attended by all the clergy of the church. The corpſe was interred juſt at the entrance into the choir, where a noble monument is erected to his memory.

Sir Iſaac was of a middling ſtature, and in the latter part of his life ſomewhat inclined to be fat. His countenance was pleaſing and at the ſame time venerable. He never made uſe of ſpectacles, and loſt but one tooth during his whole life.

His temper is ſaid to have been ſo equal and mild, that no accident could diſturb it. Of this the following remarkable inſtance is related. Sir Iſaac had a favourite little dog, which he called *Diamond;* and being one day called out of his ſtudy into the next room, Diamond was left behind. When Sir Iſaac returned, having been abſent but a few minutes, he had the mortification to find, that Diamond having thrown down a lighted candle among ſome papers, the nearly finiſhed labour of many years, was in flames, and almoſt conſumed to aſhes. This loſs, as Sir Iſaac was then very far advanced in years, was irretrievable; yet without once ſtriking the dog, he only rebuked him with this exclamation, "Oh! Diamond! Diamond! thou little knoweſt the miſchief thou haſt done!

He was a great lover of peace, and would rather have choſen to remain in obſcurity than to have the calm of life ruffled by thoſe ſtorms and diſputes which genius and learning always draw upon thoſe that are peculiarly eminent for them. In contemplating his genius it preſently becomes a doubt, which of theſe endowments had the greateſt ſhare, ſagacity, penetration, ſtrength or diligence: and after all, the mark that ſeems moſt to diſtinguiſh it is, that he himſelf made the juſteſt eſtimation of it, declaring, that, if he had done the world any ſervice, it was due to nothing but induſtry and patient thought; that he kept the ſubject under conſideration conſtantly before him, and waited till the firſt dawning opened gradually, by little and little, into a full and clear light. It is ſaid, that when he had any mathematical problems or ſolutions in his mind, he would never quit the ſubject on any account. Dinner has been often three hours ready for him before he could be brought to table: and his man often ſaid, when he has been getting up in a morning, he has ſometimes begun to dreſs, and with one leg in his breeches ſat down again on the bed, where he has remained for hours before he got his clothes on. From his love of peace, no doubt, aroſe that unuſual kind of horror which he had for all diſputes; a ſteady unbroken attention, free from thoſe frequent recoilings inſeparably incident to others, was his peculiar felicity; he knew it, and he knew the value of it. No wonder then that controverſy was looked on as his bane. When ſome objections, haſtily made to his diſcoveries concerning light and colours, induced him to lay aſide the deſign he had of publiſhing his optic lectures, we find him reflecting on that diſpute, into which he was unavoidably drawn thereby, in theſe terms: "I blamed my own imprudence for parting with ſo real a bleſſing as my quiet, to run after a ſhadow." It is true this ſhadow (as Mr Fontenelle obſerves) did not eſcape him afterwards, nor did it coſt him that quiet which he ſo much valued, but proved as much a real happineſs to him as his quiet itſelf; yet this was a happineſs of his own making: he took a reſolution, from theſe diſputes, not to publiſh any more about that theory till he had put it above the reach of controverſy, by the exacteſt experiments and the ſtricteſt demonſtrations; and accordingly it has never been called in queſtion ſince. In the ſame temper, after he had ſent the manuſcript of his *Principia* to the Royal Society, with his conſent to the printing of it by them, upon Mr Hook's injuriouſly inſiſting that himſelf had demonſtrated Kepler's problem before our author, he determined, rather than be involved again in a controverſy, to ſuppreſs the third book, and was very hardly prevailed upon to alter that reſolution. It is true, the public was thereby a gainer; that book, which is indeed no more than a corollary of ſome propoſitions in the firſt, being originally drawn up in the popular way, with the deſign to publiſh it in that form; whereas he was now convinced that it would be beſt not to let it go abroad without a ſtrict demonſtration.

After all, notwithſtanding his anxious care to avoid every occaſion of breaking his intenſe application to ſtudy, he was at a great diſtance from being ſteeped in philoſophy: on the contrary, he could lay aſide his thoughts, though engaged in the moſt intricate reſearches, when his other affairs required his attendance; and as ſoon as he had leiſure, reſume the ſubject at the point where he had left off. This he ſeems to have done not ſo much by any extraordinary ſtrength of memory, as by the force of his inventive faculty to which every thing opened itſelf again with eaſe, if nothing intervened to ruffle him. The readineſs of his invention made him not think of putting his memory much to the trial: but this was the offspring of a vigorous intenſeneſs of thought, out of which he was but a common man. He ſpent, therefore, the prime of his age in thoſe abſtruſe reſearches, when his ſituation in a college gave him leiſure, and even while ſtudy was his proper profeſſion. But as ſoon as he was removed to the mint, he applied himſelf chiefly to the buſineſs of that office; and ſo far quitted mathematics and philoſophy, as not to engage in any purſuits of either kind afterwards.

The amiable quality of modeſty is repreſented as ſtanding foremoſt in the character of this great man's mind and manners. It was in reality greater than can be eaſily imagined, or will be readily believed; yet it always continued ſo without any alteration, though the whole world, ſays Fontenelle, conſpired againſt it;

and let us add, though he was thereby robbed of his inventions of fluxions. Nicholas Mercator publiſhing his *Logarithmotechnia* in 1668, where he gave the quadrature of the hyperbola by an infinite ſeries, which was the firſt appearance in the learned world of a ſeries of this ſort drawn from the particular nature of the curve, and that in a manner very new and abſtracted; Dr Barrow, then at Cambridge, where Mr Newton, at that time about 26 years of age, reſided, recollected that he had met with the ſame thing in the writings of that young gentleman; and there not confined to the hyperbola only, but extended, by general forms, to all ſorts of curves, even ſuch as are mechanical; to their quadratures, their rectifications, and their centres of gravity; to the ſolids formed by their relations, and to the ſuperficies of thoſe ſolids; ſo that, when their determinations were poſſible, the ſeries ſtopped at a certain point, or at leaſt their ſums were given by ſtated rules; and, if the abſolute determinations were impoſſible, they could yet be infinitely approximated; which is the happieſt and moſt refined method, ſays Mr Fontenelle, of ſupplying the defects of human knowledge that man's imagination could poſſibly invent. To be maſter of ſo fruitful and general a theory was a mine of gold to a geometrician; but it was a greater glory to have been the diſcoverer of ſo ſurpriſing and ingenious a ſyſtem. So that Mr Newton finding by Mercator's book, that he was in the way to it, and that others might follow in his track, ſhould naturally have been forward to open his treaſures, and ſecure the property, which conſiſted in making the diſcovery; but he contented himſelf with his treaſure which he had found, without regarding the glory. What an idea does it give us of his unparalleled modeſty, when we ſee him declaring, that he thought Mercator had entirely diſcovered his ſecret, or that others would, before he was of a proper age for writing? His MS. upon infinite ſeries was communicated to none but Mr John Collins and the lord Brounker; and even that had not been complied with, but for Dr Barrow, who would not ſuffer him to indulge his modeſty ſo much as he deſired.

It is further obſerved, concerning this part of his character, that he never talked either of himſelf or others, nor ever behaved in ſuch a manner as to give the moſt malicious cenſurers the leaſt occaſion even to ſuſpect him of vanity. He was candid and affable, and always put himſelf upon a level with his company. He never thought either his merit or his reputation ſufficient to excuſe him from any of the common offices of ſocial life; no ſingularities, either natural or affected, diſtinguiſhed him from other men. Though he was firmly attached to the church of England, he was averſe to the perſecution of the non-conformiſts. He judged of men by their manners; and the true ſchiſmatics, in his opinion, were the vicious and the wicked. Not that he confined his principles to natural religion, for he was thoroughly perſuaded of the truth of revelation; and amidſt the great variety of books which he had conſtantly before him, that which he ſtudied with the greateſt application was the Bible: and he underſtood the nature and force of moral certainty as well as he did that of a ſtrict demonſtration.

Sir Iſaac did not neglect the opportunities of doing good, when the revenues of his patrimony, and a profitable employment, improved by a prudent economy, put it in his power. We have two remarkable inſtances of his bounty and generoſity; one to Mr M'Laurin, profeſſor of mathematics at Edinburgh, to whom he offered 20l. per annum; and the other to his niece Barton, who had an annuity of 100l. per annum ſettled upon her by him. When decency upon any occaſion required expence and ſhow, he was magnificent without grudging it, and with a very good grace; at all other times, that pomp which ſeems great to low minds only, was utterly retrenched, and the expence reſerved for better uſes. He never married, and perhaps he never had leiſure to think of it. Being immerſed in profound ſtudies during the prime of his age, and afterwards engaged in an employment of great importance, and even quite taken up with the company which his merit drew to him, he was not ſenſible of any vacancy in life, nor of the want of a companion at home. He left 32,000l. at his death; but made no will, which Mr Fontenelle tells us was becauſe he thought a legacy was no gift. As to his works, beſides what were publiſhed in his lifetime, there were found after his death, among his papers, ſeveral diſcourſes upon the ſubjects of antiquity, hiſtory, divinity, chemiſtry, and mathematics, ſeveral of which were publiſhed at different times.

NEWTONIAN *Philoſophy*, the doctrine of the univerſe, and particularly of the heavenly bodies, their laws, affections, &c. as delivered by Sir Iſaac Newton.

1
Different opinions concerning this philoſophy.

The term *Newtonian Philoſophy* is applied very differently; whence divers confuſed notions relating thereto. Some authors under this philoſophy include all the corpuſcular philoſophy, conſidered as it now ſtands corrected and reformed by the diſcoveries and improvements made in ſeveral parts thereof by Sir Iſaac Newton. In which ſenſe it is that Graveſande calls his elements of phyſics, *Introductio ad Philoſophiam Newtonianam*. And in this ſenſe the Newtonian is the ſame with the new philoſophy; and ſtands contradiſtinguiſhed from the Carteſian, the Peripatetic, and the ancient Corpuſcular.

Others, by *Newtonian Philoſophy*, mean the method or order which Sir Iſaac Newton obſerves in philoſophizing; viz. the reaſoning and drawing of concluſions directly from phenomena, excluſive of all previous hypotheſes; the beginning from ſimple principles; deducing the firſt powers and laws of nature from a few ſelect phenomena, and then applying thoſe laws, &c. to account for other things. And in this ſenſe the *Newtonian philoſophy* is the ſame with the *experimental philoſophy*, and ſtands oppoſed to the ancient *Corpuſcular*.

Others, by *Newtonian philoſophy*, mean that wherein phyſical bodies are conſidered mathematically, and where geometry and mechanics are applied to the ſolution of the appearances of nature. In which ſenſe the Newtonian is the ſame with the *mechanical* and *mathematical philoſophy*.

Others again, by *Newtonian philoſophy*, underſtand that part of phyſical knowledge which Sir Iſaac Newton has handled, improved, and demonſtrated, in his *Principia*.

Others, laſtly, by *Newtonian philoſophy*, mean the new principles which Sir Iſaac Newton has brought into philoſophy; the new ſyſtem founded thereon; and the new ſolutions of phenomena thence deduced;

Newtonian Philoſophy.

or that which characterizes and diſtinguiſhes his philoſophy from all others.—Which is the ſenſe wherein we ſhall chiefly conſider it.

As to the hiſtory of this philoſophy, we have nothing to add to what has been given in the preceding article. It was firſt made public in the year 1687, by the author, then a fellow of Trinity College, Cambridge; and in the year 1713, republiſhed with conſiderable improvements.—Several authors have ſince attempted to make it plainer; by ſetting aſide many of the more ſublime mathematical reſearches, and ſubſtituting either more obvious reaſonings or experiments in lieu thereof; particularly Whiſton in his *Prælect. Phyſ. Mathemat.* Graveſande in *Element. et Inſtit.* and Dr Pemberton in his *View*.

The whole of the *Newtonian Philoſophy*, as delivered by the author, is contained in his *Principia* or *Mathematical Principles of Natural Philoſophy*. He founds his ſyſtem on the following definitions:

Definitions on which the philoſophy is founded.

1. The quantity of matter is the meaſure of the ſame, ariſing from its denſity and bulk conjunctly.—Thus air of a double denſity, in a double ſpace, is quadruple in quantity; in a triple ſpace, ſextuple in quantity, &c.

2. The quantity of motion is the meaſure of the ſame, ariſing from the velocity and quantity of matter conjunctly. This is evident, becauſe the motion of the whole is the motion of all its parts; and therefore in a body double in quantity, with equal velocity, the motion is double, &c.

Vis inſita defined and objected to.

3. The *vis inſita*, or innate force of matter, is a power of reſiſting, by which every body, as much as in it lies, endeavours to perſevere in its preſent ſtate, whether it be of reſt, or moving uniformly forward in a right line.—This definition is proved to be juſt, only by the difficulty we find in moving any thing out of its place; and this difficulty is by ſome reckoned to proceed only from gravity. They contend, that in thoſe caſes where we can prevent the force of gravity from acting upon bodies, this power of reſiſtance becomes inſenſible, and the greateſt quantities of matter may be put in motion by the very leaſt force. Thus there have been balances formed ſo exact, that when loaded with 200 weight in each ſcale, they would turn by the addition of a ſingle drachm. In this caſe 400 lb. of matter was put in motion by a ſingle drachm, *i e* by $\frac{1}{102400}$ parts of its own quantity: and even this ſmall weight, they ſay, is only neceſſary on account of the inaccuracy of the machine: ſo that we have no reaſon to ſuppoſe, that, if the friction could be entirely removed, it would take more force to move a tun weight than a grain of ſand. This objection, however, is not taken notice of by Sir Iſaac: and he beſtows on the reſiſting power above mentioned the name of *vis inertiæ*; a phraſe which is perhaps not well choſen, and with which inferior writers have endeavoured to make their readers merry at the expence of Newton. A *force of inactivity*, it has been ſaid, is a *forceleſs* force; and analogous to a *black white*, a *cold heat*, and a *tempeſtuous calm*.

Examination of the third and fourth Definitions of the firſt Book of the Principia, &c.

But objections of more importance have been made to the whole of this doctrine than thoſe which merely reſpect the term *vis inertiæ*. "An endeavour to remain at reſt (we are told*) is unneceſſary, whilſt nothing attempts to diſturb the reſt. It is likewiſe impoſſible to be conceived, as it implies a contradiction. A man, by oppoſing force to force, may endeavour not to be moved; but this oppoſition is an endeavour to *move*, not with a *deſign* to move, but by counteracting another force to *prevent* being moved. An endeavour not to move therefore cannot exiſt in bodies, becauſe it is abſurd; and if we appeal to fact, we ſhall find every body in an actual and conſtant endeavour to move." It has been likewiſe obſerved, and we think juſtly, that "if bodies could *continue* to move by any innate force, they might alſo *begin* to move by that force. For the ſame cauſe which can move a body with a given velocity at one time, could do it, if preſent, at any other time; and therefore if the force by which bodies continue in motion were innate and eſſential to them, they would begin to move of themſelves, which is not true." Newton indeed ſays that this innate force is the cauſe of motion under certain circumſtances only, or when the body is acted upon by a force impreſſed *ab extra*. But if this impreſſed force do not continue as well as begin the motion, if it ceaſe the inſtant that the impreſſion is over, and the body continue to move by its *vis inertiæ*, why is the body ever ſtopped? "If in the beginning of the motion the body, by its innate force, overcomes a certain reſiſtance of friction and air, in any following times, the force being undiminiſhed, it will overcome the ſame reſiſtance for ever. Theſe reſiſtances, therefore, could never change the ſtate of a moving body, becauſe they cannot change the quantity of its motive force. But this is contrary to univerſal experience." For theſe reaſons we are inclined to think that bodies are wholly paſſive; that they endeavour nothing; and that they continue in motion not by any innate force or *vis inſita*, but by that force, whatever it be, which begins the motion, and which, whilſt it remains with the moving body, is gradually diminiſhed, and at laſt overcome by oppoſite forces, when the body of courſe ceaſes to move.

4. An impreſſed force is an action exerted upon a body, in order to change its ſtate, either of reſt or of moving uniformly forward in a right line.——This force conſiſts in the action only; and remains no longer in the body when the action is over. For a body maintains every new ſtate it acquires by its *vis inertiæ* only.

It is here implied, and indeed fully expreſſed, that motion is not continued by the ſame power that produced it. Now there are two grounds on which the truth of this doctrine may be ſuppoſed to reſt.

"*Firſt*, On a direct proof that the impreſſed force does not remain in the body, either by ſhowing the nature of the force to be tranſitory and incapable of more than its firſt action; or that it acts only on the ſurface, and that the body eſcapes from it; or that the force is ſomewhere elſe, and not remaining in the body. But none of theſe direct proofs are offered.

"*Secondly*, It may reſt on an indirect proof, that there is in the nature of body a ſufficient cauſe for the continuance of every new ſtate acquired; and that therefore any adventitious force to continue motion, though neceſſary for its production, is ſuperfluous and inadmiſſible. As this is the very ground on which the ſuppoſition ſtands, it ought to have been indubitably certain that the innate force of the body

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* *Young's Examination of the third and fourth Definitions of the firſt Book of the Principia, &c.*

is ſufficient to perpetuate the motion it has once acquired, before the other agent, by which the motion was communicated, had been diſmiſſed from the office. But the innate force of body has been ſhown not to be that which continues its motion; and therefore the proof, that the impreſſed force does not remain in the body, fails. Nor indeed is it in this caſe deſirable to ſupport the proof; becauſe we ſhould then be left without any reaſon for the continuance of motion †." When we mention an impreſſed force, we mean ſuch a force as is communicated either at the ſurface of the body or by being diffuſed through the maſs.

5. A centripetal force is that by which bodies are drawn, impelled, or any way tend towards a point, as to a centre.—The quantity of any centripetal force may be conſidered as of three kinds, abſolute, accelerative, and motive.

6. The abſolute quantity of a centrifugal force is the meaſure of the ſame, proportional to the efficacy of the cauſe that propagates it from the centre, through the ſpaces round about.

7. The accelerative quantity of a centripetal force is the meaſure of the ſame, proportional to the velocity which it generates in a given time.

8. The motive quantity of a centripetal force is a meaſure of the ſame, proportional to the motion which it generates in a given time.—This is always known by the quantity of a force equal and contrary to it, that is juſt ſufficient to hinder the deſcent of the body.

SCHOLIA.

4 Of Time. I. Abſolute, true, and mathematical time, of itſelf, and from its own nature, flows equably, without regard to any thing external, and, by another name, is called *duration*. Relative, apparent, and common time, is ſome ſenſible and external meaſure of duration, whether accurate or not, which is commonly uſed inſtead of true time; ſuch as an hour, a day, a month, a year, &c.

5 Space. II. Abſolute ſpace, in its own nature, without regard to any thing external, remains always ſimilar and immoveable. Relative ſpace is ſome moveable dimenſion or meaſure of the abſolute ſpaces; and which is vulgarly taken for immoveable ſpace. Such is the dimenſion of a ſubterraneous, an aerial, or celeſtial ſpace, determined by its poſition to bodies, and which is vulgarly taken for immoveable ſpace; as the diſtance of a ſubterraneous, an aerial, or celeſtial ſpace, determined by its poſition in reſpect of the earth. Abſolute and relative ſpace are the ſame in figure and magnitude; but they do not remain always numerically the ſame. For if the earth, for inſtance, moves, a ſpace of our air which, relatively and in reſpect of the earth, remains always the ſame, will at one time be one part of the abſolute ſpace into which the earth paſſes; at another time it will be another part of the ſame; and ſo, abſolutely underſtood, it will be perpetually mutable.

6 Place defined. III. Place is a part of ſpace which a body takes up; and is, according to the ſpace, either abſolute or relative. Our author ſays it is *part* of ſpace; not the ſituation, nor the external ſurface of the body. For the places of equal ſolids are always equal; but their ſuperficies, by reaſon of their diſſimilar figures, are often unequal. Poſitions properly have no quantity, are they ſo much the places themſelves as the properties of places. The motion of the whole is the ſame thing with the ſum of the motions of the parts; that is, the tranſlation of the whole out of its place is the ſame thing with the ſum of the tranſlations of the parts out of their places: and therefore the place of the whole is the ſame thing with the ſum of the places of the parts; and for that reaſon it is internal, and in the whole body.

7 Of Motion. IV. Abſolute motion is the tranſlation of a body from one abſolute place into another, and relative motion the tranſlation from one relative place into another. Thus, in a ſhip under ſail, the relative place of a body is that part of the ſhip which the body poſſeſſes, or that part of its cavity which the body fills, and which therefore moves together with the ſhip; and relative reſt is the continuance of the body in the ſame part of the ſhip, or of its cavity. But real abſolute reſt is the continuance of the body in the ſame part of that immoveable ſpace in which the ſhip itſelf, its cavity, and all that it contains, is moved. Wherefore, if the earth is really at reſt, the body which relatively reſts in the ſhip will really and abſolutely move with the ſame velocity which the ſhip has on the earth. But if the earth alſo moves, the true and abſolute motion of the body will ariſe, partly from the true motion of the earth in immoveable ſpace; partly from the relative motion of the ſhip on the earth: and if the body moves alſo relatively in the ſhip, its true motion will ariſe partly from the true motion of the earth in immoveable ſpace, and partly from the relative motions as well of the ſhip on the earth as of the body in the ſhip; and from theſe relative motions will ariſe the relative motion of the body on the earth. As if that part of the earth where the ſhip is, was truly moved towards the eaſt, with a velocity of 10010 parts; while the ſhip itſelf with a freſh gale is carried towards the weſt, with a velocity expreſſed by 10 of theſe parts; but a ſailor walks in the ſhip towards the eaſt with one part of the ſaid velocity: then the ſailor will be moved truly and abſolutely in immoveable ſpace towards the eaſt with a velocity of 1001 parts; and relatively on the earth towards the weſt, with a velocity of 9 of thoſe parts.

Abſolute time, in aſtronomy, is diſtinguiſhed from relative, by the equation or correction of the vulgar time. For the natural days are truly unequal, though they are commonly conſidered as equal, and uſed for a meaſure of time: aſtronomers correct this inequality for their more accurate deducing of the celeſtial motions. It may be that there is no ſuch thing as an equable motion whereby time may be accurately meaſured. All motions may be accelerated or retarded; but the true or equable progreſs of abſolute time is liable to no change. The duration or perſeverance of the exiſtence of things remains the ſame, whether the motions are ſwift or ſlow, or none at all; and therefore ought to be diſtinguiſhed from what are only ſenſible meaſures thereof, and out of which we collect it by means of the aſtronomical equation. The neceſſity of which equation for determining the times of a phenomenon is evinced, as well from the experiments of the pendulum clock as by eclipſes of the ſatellites of Jupiter.

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† *Young's Examination, &c.*

8
Immutability of time and ſpace.

As the order of the parts of time is immutable, ſo alſo is the order of the parts of ſpace. Suppoſe thoſe parts to be moved out of their places, and they will be moved (if we may be allowed the expreſſion) out of themſelves. For times and ſpaces are, as it were, the places of themſelves as of all other things. All things are placed in time as to order of ſucceſſion; and in ſpace as to order of ſituation. It is from their eſſence or nature that they are places; and that the primary places of things ſhould be moveable, is abſurd. Theſe are therefore the abſolute places; and tranſlations out of thoſe places are the only abſolute motions.

But becauſe the parts of ſpace cannot be ſeen, or diſtinguiſhed from one another by the ſenſes, therefore in their ſtead we uſe ſenſible meaſures of them. For, from the poſitions and diſtances of things from any body, conſidered as immoveable, we define all places; and then with reſpect to ſuch places, we eſtimate all motions, conſidering bodies as transferred from ſome of thoſe places into others. And ſo, inſtead of abſolute places and motions, we uſe relative ones; and that without any inconvenience in common affairs: but in philoſophical diſquiſitions we ought to abſtract from our ſenſes, and conſider things themſelves diſtinct from what are only ſenſible meaſures of them. For it may be, that there is no body really at reſt, to which the places and motions of others may be referred.

But we may diſtinguiſh reſt and motion, abſolute and relative, one from the other by their properties cauſes, and effects. It is a property of reſt, that bodies really at reſt do reſt in reſpect of each other. And therefore, as it is poſſible, that, in the remote regions of the fixed ſtars, or perhaps far beyond them, there may be ſome body abſolutely at reſt, though it be impoſſible to know from the poſition of bodies to one another in our regions, whether any of theſe do keep the ſame poſition to that remote body; it follows, that abſolute reſt cannot be determined from the poſition of bodies in our regions.

9
Of the motion of different bodies with reſpect to one another.

It is a property of motion, that the parts which retain given poſitions to their wholes do partake of the motion of their wholes. For all parts of revolving bodies endeavour to recede from the axis of motion; and the impetus of bodies moving forwards ariſes from the joint impetus of all the parts. Therefore if ſurrounding bodies are moved, thoſe that are relatively at reſt within them will partake of their motion. Upon which account the true and abſolute motion of a body cannot be determined by the tranſlation of it from thoſe only which ſeem to reſt; for the external bodies ought not only to appear at reſt, but to be really at reſt. For otherwiſe all included bodies, beſide their tranſlation from near the ſurrounding ones, partake likewiſe of their true motions; and though that tranſlation was not made, they would not really be at reſt, but only ſeem to be ſo. For the ſurrounding bodies ſtand in the like relation to the ſurrounded, as the exterior part of a whole does to the interior, or as the ſhell does to the kernel; but if the ſhell moves, the kernel will alſo move, as being part of the whole, without any removal from near the ſhell.

A property near akin to the preceding is, that if a place is moved, whatever is placed therein moves along with it; and therefore a body which is moved from a place in motion, partakes alſo of the motion of its place. Upon which account all motions from places in motion, are no other than parts of entire and abſolute motions; and every entire motion is compoſed of the motion of the body out of its firſt place, and the motion of this place out of its place; and ſo on, until we come to ſome immoveable place, as in the above mentioned example of the ſailor. Wherefore entire and abſolute motions can be no otherwiſe determined than by immoveable places. Now, no other places are immoveable but thoſe that from infinity to infinity do all retain the ſame given poſitions one to another; and upon this account muſt ever remain unmoved, and do thereby conſtitute what we call *immoveable ſpace*.

The cauſes by which true and relative motions are diſtinguiſhed one from the other, are the forces impreſſed upon bodies to generate motion. True motion is neither generated nor altered, but by ſome force impreſſed upon the body moved: but relative motion may be generated or altered without any force impreſſed upon the body. For it is ſufficient only to impreſs ſome force on other bodies with which the former is compared, that by their giving way, that relation may be changed, in which the relative reſt or motion of the other body did conſiſt. Again, True motion ſuffers always ſome change from any force impreſſed upon the moving body; but relative motion does not neceſſarily undergo any changes by ſuch forces. For if the ſame forces are likewiſe impreſſed on thoſe other bodies with which the compariſon is made, that the relative poſition may be preſerved; then that condition will be preſerved, in which the relative motion conſiſts. And therefore any relative motion may be changed when the true motion remains unaltered, and the relative may be preſerved when the true motion ſuffers ſome change. Upon which account true motion does by no means conſiſt in ſuch relations.

10
Abſolute and relative motion diſtinguiſhed.

The effects which diſtinguiſh abſolute from relative motion are, the forces of receding from the axis of circular motion. For there are no ſuch forces in a circular motion purely relative: but, in a true and abſolute circular motion, they are greater or leſs according to the quantity of the motion. If a veſſel, hung by a long cord, is ſo often turned about that the cord is ſtrongly twiſted, then filled with water, and let go, it will be whirled about the contrary way; and while the cord is untwiſting itſelf, the ſurface of the water will at firſt be plain, as before the veſſel began to move; but the veſſel, by gradually communicating its motion to the water, will make it begin ſenſibly to revolve, and recede by little and little from the middle, and aſcend to the ſides of the veſſel, forming itſelf into a concave figure; and the ſwifter the motion becomes, the higher will the water riſe, till at laſt, performing its revolutions in the ſame times with the veſſel, it becomes relatively at reſt in it. This aſcent of the water ſhows its endeavour to recede from the axis of its motion; and the true and abſolute circular motion of the water, which is here directly contrary to the relative, diſcovers itſelf, and may be meaſured by this endeavour. At firſt, when the relative motion in the water was greateſt, it produced no endeavour to recede from the axis; the water ſhowed no tendency to the circumference, nor any aſcent towards the ſides of the veſſel, but remained of a plane ſurface; and therefore its true circular motion had not yet begun. But afterwards, when the relative motion of the water had decreaſed, the aſcent thereof towards the ſides of the veſſel proved its endeavour to recede from the axis; and this endeavour ſhowed the real circular motion of the water perpetually increaſing, till it had acquired its greateſt quantity, when the water reſted relatively in the veſſel. And therefore this endeavour does not depend upon any tranſlation of the water in reſpect of the ambient bodies; nor can true circular motion be defined by ſuch tranſlations. There is only one real circular motion of any one revolving body, correſponding to only one power of endeavouring to recede from its axis of motion, as its proper and adequate effect: but relative motions in one and the ſame body are innumerable, according to the various relations it bears to external bodies; and, like other relations, are altogether deſtitute of any real effect, otherwiſe than they may perhaps participate of that only true motion. And therefore, in the ſyſtem which ſuppoſes that our heavens, revolving below the ſphere of the fixed ſtars, carry the planets along with them, the ſeveral parts of thoſe heavens and the planets, which are indeed relatively at reſt in their heavens, do yet really move. For they change their poſition one to another, which never happens to bodies truly at reſt; and being carried together with the heavens, participate of their motions, and, as parts of revolving wholes, endeavour to recede from the axis of their motion.

Wherefore relative quantities are not the quantities themſelves whoſe names they bear, but thoſe ſenſible meaſures of them, either accurate or inaccurate, which are commonly uſed inſtead of the meaſured quantities themſelves. And then, if the meaning of words is to be determined by their uſe, by the names *time*, *ſpace*, *place*, and *motion*, their meaſures are properly to be underſtood; and the expreſſion will be unuſual and purely mathematical, if the meaſured quantities themſelves are meant.

It is indeed a matter of great difficulty to diſcover, and effectually to diſtinguiſh, the true motions of particular bodies from thoſe that are only apparent: becauſe the parts of that immoveable ſpace in which thoſe motions are performed, do by no means come under the obſervation of our ſenſes. Yet we have ſome things to direct us in this intricate affair; and theſe ariſe partly from the apparent motions which are the difference of the true motions, partly from the forces which are the cauſes and effects of the true motions. For inſtance, if two globes, kept at a given diſtance one from the other by means of a cord that connects them, were revolved about their common centre of gravity; we might, from the tenſion of the cord, diſcover the endeavour of the globes to recede from the axis of motion, and from thence we might compute the quantity of their circular motions. And then, if any equal forces ſhould be impreſſed at once on the alternate faces of the globes to augment or diminiſh their circular motions, from the increaſe or decreaſe of the tenſion of the cord we might infer the increment or decrement of their motions; and thence would be found on what faces thoſe forces ought to be impreſſed that the motions of the globes might be moſt augmented; that is, we might diſcover their hindermoſt faces, or thoſe which follow in the circular motion. But the faces which follow being known, and conſequently the oppoſite ones that precede, we ſhould likewiſe know the determination of their motions. And thus we might find both the quantity and determination of this circular motion, even in an immenſe vacuum, where there was nothing external or ſenſible, with which the globes might be compared. But now, if in that ſpace ſome remote bodies were placed that kept always a given poſition one to another, as the fixed ſtars do in our regions; we could not indeed determine from the relative tranſlation of the globes among thoſe bodies, whether the motion did belong to the globes or to the bodies. But if we obſerved the cord, and found that its tenſion was that very tenſion which the motions of the globes required, we might conclude the motion to be in the globes, and the bodies to be at reſt; and then, laſtly, from the tranſlation of the globes among the bodies, we ſhould find the determination of their motions.

Having thus explained himſelf, Sir Iſaac propoſes to ſhow how we are to collect the true motions from their cauſes, effects, and apparent differences; and *vice verſa*, how, from the motions, either true or apparent, we may come to the knowledge of their cauſes and effects. In order to this, he lays down the following axioms or laws of motion.

11 Laws of motion.

12 Objections to the firſt law.

1. EVERY BODY PERSEVERES IN ITS STATE OF REST, OR OF UNIFORM MOTION IN A RIGHT LINE, UNLESS IT IS COMPELLED TO CHANGE THAT STATE BY FORCES IMPRESSED UPON IT.—Sir Iſaac's proof of this axiom is as follows: "Projectiles perſevere in their motions, ſo far as they are not retarded by the reſiſtance of the air, or impelled downwards by the force of gravity. A top, whoſe parts, by their coheſion, are perpetually drawn aſide from rectilinear motions, does not ceaſe its rotation otherwiſe than as it is retarded by the air. The greater bodies of the planets and comets, meeting with leſs reſiſtance in more free ſpaces, preſerve their motions, both progreſſive and circular, for a much longer time."—Notwithſtanding this demonſtration, however, the axiom hath been violently diſputed. It hath been argued, that bodies continue in their ſtate of motion becauſe they are ſubjected to the continual impulſe of an inviſible and ſubtile fluid, which always pours in from behind, and of which all places are full. It hath been affirmed that motion is as natural to this fluid as reſt is to all other matter. It is ſaid, moreover, that it is impoſſible we can know in what manner a body would be influenced by moving forces if it was entirely deſtitute of gravity. According to what we can obſerve, the momentum of a body, or its tendency to move, depends very much on its gravity. A heavy cannon-ball will fly to a much greater diſtance than a light one, though both are actuated by an equal force. It is by no means clear, therefore, that a body totally deſtitute of gravity would have any proper momentum of its own; and if it had no momentum, it could not continue its motion for the ſmalleſt ſpace of time after the moving power was withdrawn. Some have imagined that matter was capable of beginning motion of itſelf, and conſequently that the axiom was falſe; becauſe we ſee plainly that matter in ſome caſes hath a tendency

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to change from a ſtate of motion to a ſtate of reſt, and from a ſtate of reſt to a ſtate of motion. A paper appeared on this ſubject in the firſt volume of the Edinburgh Phyſical and Literary Eſſays; but the hypotheſis never gained any ground.

2. THE ALTERATION OF MOTION IS EVER PROPORTIONAL TO THE MOTIVE FORCE IMPRESSED; AND IS MADE IN THE DIRECTION OF THE RIGHT LINE IN WHICH THAT FORCE IS IMPRESSED.—Thus, if any force generates a certain quantity of motion, a double force will generate a double quantity, whether that force be impreſſed all at once, or in ſucceſſive moments. To this law no objection of conſequence has ever been made. It is founded on this ſelf-evident truth, that every effect muſt be proportional to its cauſe. Mr Young, who ſeems to be very ambitious of detecting the errors of Newton, finds fault indeed with the expreſſions in which the law is ſtated; but he owns, that if thus expreſſed, *The alteration of motion is proportional to the actions or reſiſtances which produce it, and is in the direction in which the actions or reſiſtances are made*, it would be unexceptionable.

13 Objections to the third law.

3. TO EVERY ACTION THERE ALWAYS IS OPPOSED AN EQUAL RE-ACTION: OR THE MUTUAL ACTION OF TWO BODIES UPON EACH OTHER ARE ALWAYS EQUAL, AND DIRECTED TO CONTRARY PARTS.—This axiom is alſo diſputed by many. In the above-mentioned paper in the Phyſical Eſſays, the author endeavours to make a diſtinction between re-action and reſiſtance; and the ſame attempt has been made by Mr Young. "When an action generates no motion (ſays he), it is certain that its effects have been deſtroyed by a contrary and equal action. When an action generates two contrary and equal motions, it is alſo evident that mutual actions were exerted, equal and contrary to each other. All caſes where one of theſe conditions are not found, are exceptions to the truth of the law. If a finger preſſes againſt a ſtone, the ſtone, if it does not yield to the preſſure, preſſes as much upon the finger: but if the ſtone yields, it re-acts leſs than the finger acts; and if it ſhould yield with all the momentum that the force of the preſſure ought to generate, which it would do if it were not impeded by friction, or a medium, it would not re-act at all. So if the ſtone drawn by a horſe, follows after the horſe, it does not re-act ſo much as the horſe acts; but only ſo much as the velocity of the ſtone is diminiſhed by friction, and it is the re-action of friction only, not of the ſtone. The ſtone does not re-act becauſe it does not act, it reſiſts, but reſiſtance is not action.

"In the loſs of motion from a ſtriking body, equal to the gain in the body ſtruck, there is a plain ſolution without requiring any re-action. The motion *loſt* is identically that which is *found* in the other body; this ſuppoſition accounts for the whole phenomenon in the moſt ſimple manner. If it be not admitted, but the ſolution by re-action is inſiſted upon, it will be incumbent on the party to account for the whole effect of communication of motion; otherwiſe he will lie under the imputation of rejecting a ſolution which is ſimple, obvious, and perfect; for one complex, unnatural, and incomplete. However this may be determined, it will be allowed, that the circumſtances mentioned, afford no ground for the inference, that action and re-action are equal, ſince appearances may be explained in another way" (A).

Others grant that Sir Iſaac's axiom is very true in reſpect to terreſtrial ſubſtances; but they affirm, that, in

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(A) If there be a perfect reciprocity betwixt an impinging body and a body at reſt ſuſtaining its impulſe, may we not at our pleaſure conſider either body as the agent, and the other as the reſiſtant? Let a moving body, A, paſs from north to ſouth, an equal body B at reſt, which receives the ſtroke of A, act upon A from ſouth to north, and A reſiſt in a contrary direction, both inelaſtic: let the motion reciprocally communicated be called ſix. Then B at reſt communicates to A ſix degrees of motion towards the north, and receives ſix degrees towards the ſouth. B having no other motion than the ſix degrees it communicated, will, by its equal and contrary loſs and gain, remain in equilibrio. Let the original motion of A have been twelve, then A having received a contrary action equal to ſix, ſix degrees of its motion will be deſtroyed or in equilibrio; conſequently, a motive force as ſix will remain to A towards the ſouth, and B will be in equilibrio, or at reſt. A will then endeavour to move with ſix degrees, or half its original motion, and B will remain at reſt as before. A and B being equal maſſes, by the laws of communication three degrees of motion will be communicated to B, or A with its ſix degrees will act with three, and B will re-act alſo with three. B then will act on A from ſouth to north equal to three, while it is acted upon or reſiſted by A from north to ſouth, equal alſo to three, and B will remain at reſt as before; A will alſo have its ſix degrees of motion reduced to one half by the contrary action of B, and only three degrees of motion will remain to A, with which it will yet endeavour to move; and finding B ſtill at reſt, the ſame proceſs will be repeated till the whole motion of A is reduced to an infinitely ſmall quantity, B all the while remaining at reſt, and there will be no communication of motion from A to B, which is contrary to experience.

Let a body, A, whoſe maſs is twelve, at reſt, be impinged upon firſt by B, having a maſs as twelve, and a velocity as four, making a momentum of 48; and ſecondly by C, whoſe maſs is ſix, and velocity eight, making a momentum of 48 equal to B, the three bodies being inelaſtic. In the firſt caſe, A will become poſſeſſed of a momentum of 24, and 24 will remain to B; and, in the ſecond caſe, A will become poſſeſſed of a momentum of 32, and 16 will remain to C, both bodies moving with equal velocities after the ſhock, in both caſes, by the laws of percuſſion. It is required to know, if in both caſes A reſiſts equally, and if B and C act equally? if the actions and reſiſtances are equal, how does A in one caſe deſtroy 24 parts of B's motion, and in the other caſe 32 parts of C's motion, by an equal reſiſtance? And how does B communicate in one caſe 24 degrees of motion, and C 32, by equal actions? If the actions and reſiſtances are unequal, it is aſked how the ſame maſs can reſiſt differently to bodies impinging upon it with equal momenta, and how bodies in theſe, both action and re-action, are the effects of gravity. Subſtances void of gravity would have no momentum; and without this they could not act; they ſhould be moved by the leaſt force, and therefore could not reſiſt or re-act. If therefore there is any fluid which is the cauſe of gravity, though ſuch fluid could act upon terreſtrial ſubſtances, yet theſe could not re-act upon it; becauſe they have no force of their own, but depend entirely upon it for their momentum. In this manner, ſay they, we may conceive that the planets circulate, and all the operations of nature are carried on by means of a ſubtile fluid; which being perfectly active, and the reſt of matter altogether paſſive, there is neither reſiſtance nor loſs of motion. See Motion.

From the preceding axiom Sir Iſaac draws the following corollaries.

1. A body by two forces conjoined will deſcribe the diagonal of a parallelogram in the ſame time that it would deſcribe the ſides by thoſe forces apart.

2. Hence we may explain the compoſition of any one direct force out of any two oblique ones, viz. by making the two oblique forces the ſides of a parallelogram, and the direct one the diagonal.

3. The quantity of motion, which is collected by taking the ſum of the motions directed towards the ſame parts, and the difference of thoſe that are directed to contrary parts, ſuffers no change from the action of bodies among themſelves; becauſe the motion which one body loſes is communicated to another: and if we ſuppoſe friction and the reſiſtance of the air to be abſent, the motion of a number of bodies which mutually impelled one another would be perpetual, and its quantity always equal.

4. The common centre of gravity of two or more bodies does not alter its ſtate of motion or reſt by the actions of the bodies among themſelves; and therefore the common centre of gravity of all bodies acting upon each other (excluding outward actions and impediments) is either at reſt, or moves uniformly in a right line.

5. The motions of bodies included in a given ſpace are the ſame among themſelves, whether that ſpace is at reſt, or moves uniformly forward in a right line without any circular motion. The truth of this is evidently ſhown by the experiment of a ſhip; where all motions happen after the ſame manner, whether the ſhip is at reſt, or proceeds uniformly forward in a ſtraight line.

6. If bodies, anyhow moved among themſelves, are urged in the dirction of parallel lines by equal accelerative forces, they will all continue to move among themſelves, after the ſame manner as if they had been urged by no ſuch forces.

The whole of the mathematical part of the Newtonian philoſophy depends on the following lemmas; of which the firſt is the principal.

Lem. I. Quantities, and the ratios of quantities, which in any finite time converge continually to equality, and before that time approach nearer the one to the other than by any given difference, become ultimately equal. If you deny it; ſuppoſe them to be ultimately unequal, and let D be their ultimate difference. Therefore they cannot approach nearer to equality than by that given difference D; which is againſt the ſuppoſition.

Newtonian Philoſophy.

14 Objections to the firſt lemma,

Concerning the meaning of this lemma philoſophers are not agreed; and unhappily it is the very fundamental poſition on which the whole of the ſyſtem reſts. Many objections have been raiſed to it by people who ſuppoſed themſelves capable of underſtanding it. They ſay, that it is impoſſible we can come to an end of any infinite ſeries, and therefore that the word *ultimate* can in this caſe have no meaning. In ſome caſes the lemma is evidently falſe. Thus, ſuppoſe there are two quantities of matter A and B, the one containing half a pound, and the other a third part of one. Let both be continually divided by 2; and though their ratio, or the proportion of the one to the other, doth not vary, yet the difference between them perpetually becomes leſs, as well as the quantities themſelves, until both the difference and quantities themſelves become leſs than any aſſignable quantity: yet the difference will never totally vaniſh, nor the quantities become equal, as is evident from the two following ſeries.

$$\begin{array}{lcccccccccc}
 & \frac{1}{2} & \frac{1}{4} & \frac{1}{8} & \frac{1}{16} & \frac{1}{32} & \frac{1}{64} & \frac{1}{128} & \frac{1}{256} & \frac{1}{512} & \frac{1}{1024}, \&c. \\
 & \frac{1}{3} & \frac{1}{6} & \frac{1}{12} & \frac{1}{24} & \frac{1}{48} & \frac{1}{96} & \frac{1}{192} & \frac{1}{384} & \frac{1}{768} & \frac{1}{1536}, \&c. \\
\text{Diff.} & \frac{1}{6} & \frac{1}{12} & \frac{1}{24} & \frac{1}{48} & \frac{1}{96} & \frac{1}{192} & \frac{1}{384} & \frac{1}{768} & \frac{1}{1536} & \frac{1}{3072}, \&c.
\end{array}$$

Thus we ſee, that though the difference is continually diminiſhing, and that in a very large proportion, there is no hope of its vaniſhing, or the quantities becoming equal. In like manner, let us take the proportions or ratios of quantities, and we ſhall be equally unſucceſsful. Suppoſe two quantities of matter, one containing 8 and the other 10 pounds; theſe quantities already have to each other the ratio of 8 to 10, or of 4 to 5; but let us add 2 continually to each of them, and though the ratios continually come nearer to that of equality, it is in vain to hope for a perfect coincidence. Thus,

$$\begin{array}{lccccccccc}
 & 8 & 10 & 12 & 14 & 16 & 18 & 20 & 22 & 24, \&c. \\
 & 10 & 12 & 14 & 16 & 18 & 20 & 22 & 24 & 26, \&c. \\
\text{Ratio} & \frac{4}{5} & \frac{5}{6} & \frac{6}{7} & \frac{7}{8} & \frac{8}{9} & \frac{9}{10} & \frac{10}{11} & \frac{11}{12} & \frac{12}{13}, \&c.
\end{array}$$

15 Objection anſwered.

For this and his other lemmas Sir Iſaac makes the following apology. "Theſe lemmas are premiſed, to avoid the tediouſneſs of deducing perplexed demonſtrations *ad abſurdum*, according to the method of ancient geometers. For demonſtrations are more contracted by the method of indiviſibles: but becauſe the hypotheſis of indiviſibles ſeems ſomewhat harſh, and therefore that method is reckoned leſs geometrical, I choſe rather to reduce the demonſtrations of the following propoſitions to the firſt and laſt ſums and ratios of naſcent and evaneſcent quantities, that is, to the limits of thoſe ſums and ratios; and ſo to premiſe, as ſhort as I could, the demonſtrations of thoſe limits.

For

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bodies poſſeſſed of equal momenta can exert different actions, it being admitted that bodies reſiſt proportional to their maſſes, and that their power of overcoming reſiſtance is proportional to their momenta?

It is incumbent on thoſe who maintain the doctrine of univerſal re-action, to free it from theſe difficulties and apparent contradictions.

For hereby the ſame thing is performed as by the method of indiviſibles; and now thoſe principles being demonſtrated, we may uſe them with more ſafety.—Therefore, if hereafter I ſhould happen to conſider quantities as made up of particles, or ſhould uſe little curve lines for right ones; I would not be underſtood to mean indiviſibles, but evaneſcent diviſible quantities; not the ſums and ratios of determinate parts, but always the limits of ſums and ratios; and that the force of ſuch demonſtrations always depends on the method laid down in the foregoing lemmas.

"Perhaps it may be objected, that there is no ultimate proportion of evaneſcent quantities, becauſe the proportion, before the quantities have vaniſhed, is not the ultimate, and, when they are vaniſhed, is none.—But by the ſame argument it may be alleged, that a body arriving at a certain place, and there ſtopping, has no ultimate velocity; becauſe the velocity before the body comes to the place is not its ultimate velocity; when it is arrived, it has none. But the anſwer is eaſy: for by the ultimate velocity is meant that with which the body is moved, neither before it arrives at its place and the motion ceaſes, nor after; but at the very inſtant it arrives; that is, that velocity with which the body arrives at its laſt place, and with which the motion ceaſes. And in like manner, by the ultimate ratio of evaneſcent quantities is to be underſtood the ratio of the quantities, not before they vaniſh, nor afterwards, but with which they vaniſh. In like manner, the firſt ratio of naſcent quantities is that with which they begin to be. And the firſt or laſt ſum is that with which they begin and ceaſe to be (or to be augmented and diminiſhed). There is a limit which the velocity at the end of the motion may attain, but not exceed; and this is the ultimate velocity. And there is the like limit in all quantities and proportions that begin and ceaſe to be. And, ſince ſuch limits are certain and definite, to determine the ſame is a problem ſtrictly geometrical. But whatever is geometrical we may be allowed to make uſe of in determining and demonſtrating any other thing that is likewiſe geometrical.

"It may alſo be objected, that if the ultimate ratios of evaneſcent quantities are given, their ultimate magnitudes will be alſo given; and ſo all quantities will conſiſt of indiviſibles, which is contrary to what Euclid has demonſtrated concerning incommenſurables, in the 10th book of his Elements. But this objection is founded on a falſe ſuppoſition. For thoſe ultimate ratios with which quantities vaniſh are not truly the ratios of ultimate quantities, but limits towards which the ratios of quantities decreaſing continually approach."

Lem. II. If in any figure AacE (Plate CCCXLV. N° 1.) terminated by the right line Aa, AE, and the curve acE, there be inſcribed any number of parallelograms Ab, Bc, Cd, &c. comprehended under equal baſes AB, BC, CD, &c. and the ſides Bb, Cc, Dd, &c. parallel to one ſide Aa of the figure; and the parallelograms $aKbl$, $bLcm$, $cMdn$, &c. are completed.—Then if the breadth of thoſe parallelograms be ſuppoſed to be diminiſhed, and their number augmented *in infinitum*; the ultimate ratios which the inſcribed figure $AKbLcMdD$, the circumſcribed figure $AalbmcndoE$, and curvilinear figure $AabcdE$, will have to one another, are ratios of equality.—For the difference of the inſcribed and circumſcribed figures is the ſum of the parallelograms Kl, Lm, Mn, Do; that is (from the equality of all their baſes), the rectangle under one of their baſes Kb, and the ſum of their altitudes Aa, that is, the rectangle $ABla$.—But this rectangle, becauſe its breadth AB is ſuppoſed diminiſhed *in infinitum*, becomes leſs than any given ſpace. And therefore by Lem. I. the figures inſcribed and circumſcribed become ultimately equal the one to the other; and much more will the intermediate curvilinear figure be ultimately equal to either.

Lem. III. The ſame ultimate ratios are alſo ratios of equality, when the breadths AB, BC, CD, &c. of the parallelograms are unequal, and are all diminiſhed *in infinitum*.—The demonſtration of this differs but little from that of the former.

In his ſucceeding lemmas, Sir Iſaac goes on to prove, in a manner ſimilar to the above, that the ultimate ratios of the ſine, chord, and tangent of arcs infinitely diminiſhed, are ratios of equality, and therefore that in all our reaſonings about theſe we may ſafely uſe the one for the other:—that the ultimate form of evaneſcent triangles made by the arc, chord, and tangent, is that of ſimilitude, and their ultimate ratio is that of equality; and hence, in reaſonings about ultimate ratios, we may ſafely uſe theſe triangles for each other, whether made with the ſine, the arc, or the tangent.—He then ſhows ſome properties of the ordinates of curvilinear figures; and proves that the ſpaces which a body deſcribes by any finite force urging it, whether that force is determinate and immutable, or is continually augmented or continually diminiſhed, are, in the very beginning of the motion, one to the other in the duplicate ratio of the powers. And, laſtly, Having added ſome demonſtrations concerning the evaneſcence of angles of contact, he proceeds to lay down the mathematical part of his ſyſtem, and which depends on the following theorems:

Theor. I. The areas which revolving bodies deſcribe by radii drawn to an immoveable centre of force, lie in the ſame immoveable planes, and are proportional to the times in which they are deſcribed.—For, ſuppoſe the time to be divided into equal parts, and in the firſt part of that time, let the body by its innate force deſcribe the right line AB (N° 2.); in the ſecond part of that time, the ſame would, by Law 1. if not hindered, proceed directly to c along the line $Bc = AB$; ſo that by the radii AS, BS, cS, drawn to the centre, the equal areas ASB, BSc, would be deſcribed. But, when the body is arrived at B, ſuppoſe the centripetal force acts at once with a great impulſe, and turning aſide the body from the right line Bc, compels it afterwards to continue its motion along the right line BC. Draw cC parallel to BS, meeting BC in C; and at the end of the ſecond part of the time, the body, by Cor. 1. of the Laws, will be found in C, in the ſame plane with the triangle ASB. Join SC; and becauſe SB and cC are parallel, the triangle SBC will be equal to the triangle SBC, and therefore alſo to the triangle SAB. By the like argument, if the centripetal force acts ſucceſſively in C, D, E, &c. and makes the body in each ſingle particle of time to deſcribe the right lines CD, DE, EF, &c. they will all lie in the ſame plane ; and the triangle SCD will be equal to the triangle SBC, and SDE to SCD, and SEF to SDE. And therefore, in equal times, equal areas are deſcribed in one immoveable plane ; and, by compoſition, any ſums SADS, SAFS, of thoſe areas are, one to the other, as the times in which they are deſcribed. Now, let the number of thoſe triangles be augmented, and their ſize diminiſhed *in infinitum ;* and then, by the preceding lemmas, their ultimate perimeter ADF will be a curve line : and therefore the centripetal force by which the body is perpetually drawn back from the tangent of this curve will act continually ; and any deſcribed areas SADS, SAFS, which are always proportional to the times of deſcription, will, in this caſe alſo, be proportional to thoſe times Q. E. D.

Cor. 1. The velocity of a body attracted towards an immoveable centre, in ſpaces void of reſiſtance, is reciprocally as the perpendicular let fall from that centre on the right line which touches the orbit. For the velocities in theſe places, A, B, C, D, E, are as the baſes AB, BC, DE, EF, of equal triangles ; and theſe baſes are reciprocally as the perpendiculars let fall upon them.

Cor. 2. If the chords AB, BC, of two arcs, ſucceſſively deſcribed in equal times by the ſame body, in ſpaces void of reſiſtance, are completed into a parallelogram ABCV, and the diagonal BV of this parallelogram, in the poſition which it ultimately acquires when thoſe arcs are diminiſhed *in infinitum*, is produced both ways, it will paſs through the centre of force.

Cor. 3. If the chords AB, BC, and DE, EF, of arcs deſcribed in equal times, in ſpaces void of reſiſtance, are completed into the parallelograms ABCV, DEFZ, the forces in B and E are one to the other in the ultimate ratio of the diagonals BV, EZ, when thoſe arcs are diminiſhed *in infinitum.* For the motions BC and EF of the body (by Cor. 1. of the laws), are compounded of the motions B*c*, BV and E*f*, EZ ; but BV and EZ, which are equal to C*c*= and F*f*, in the demonſtration of this propoſition, were generated by the impulſes of the centripetal force in B and E, and are therefore proportional to thoſe impulſes.

Cor. 4. The forces by which bodies, in ſpaces void of reſiſtance, are drawn back from rectilinear motions, and turned into curvilinear orbits, are one to another as the verſed ſines of arcs deſcribed in equal times ; which verſed ſines tend to the centre of force, and biſect the chords when theſe arcs are diminiſhed to infinity. For ſuch verſed ſines are the halfs of the diagonals mentioned in Cor. 3.

Cor. 5. And therefore thoſe forces are to the force of gravity, as the ſaid verſed ſines to the verſed ſines perpendicular to the horizon of thoſe parabolic arcs which projectiles deſcribe in the ſame time.

Cor. 6. And the ſame things do all hold good (by Cor. 5. of the laws) when the planes in which the bodies are moved, together with the centres of force, which are placed in thoſe planes, are not at reſt, but move uniformly forward in right lines.

Theor. II. Every body that moves in any curve line deſcribed in a plane, and, by a radius drawn to a point either immoveable or moving forward with an uniform rectilinear motion, deſcribes about that point areas proportional to the times, is urged by a centripetal force directed to that point.

Case I. For every body that moves in a curve line is (by Law 1.) turned aſide from its rectilinear courſe by the action of ſome force that impels it ; and that force by which the body is turned off from its rectilinear courſe, and made to deſcribe in equal times the leaſt equal triangles SAB, SBC, SCD, &c. about the immoveable point S, (by Prop. 40. E. 1. and Law 2.) acts in the place B according to the direction of a line parallel to C ; that is, in the direction of the line BS ; and in the place C according to the direction of a line parallel to *d* D, that is, in the direction of the line CS, &c. ; and therefore acts always in the direction of lines tending to the immoveable point S. Q. E. D.

Case II. And (by Cor. 5. of the laws) it is indifferent whether the ſuperficies in which a body deſcribes a curvilinear figure be quieſcent, or moves together with the body, the figure deſcribed, and its point S, uniformly forward in right lines.

Cor. 1. In non-reſiſting ſpaces or mediums, if the the areas are not proportional to the times, the forces are not directed to the point in which the radii meet ; but deviate therefrom *in conſequentia*, or towards the parts to which the motion is dirjected, if the deſcription of the areas is accelerated ; but *in antecedentia* if retarded.

Cor. 2. And even in reſiſting mediums, if the deſcription of the areas is accelerated, the directions of the forces deviate from the point in which the radii meet, towards the parts to which the motion tends.

Scholium.

A body may be urged by a centripetal force compounded of ſeveral forces. In which caſe the meaning of the propoſition is, that the force which reſults out of all tends to the point S. But if any force acts perpetually in the direction of lines perpendicular to the deſcribed ſurface, this force will make the body to deviate from the plane of its motion, but will neither augment nor diminiſh the quantity of the deſcribed ſurface ; and is therefore not to be neglected in the compoſition of forces.

Theor. III. Every body that, by a radius drawn to the centre of another body, howſoever moved, deſcribes areas about that centre proportional to the times, is urged by a force compounded of the centripetal forces tending to that other body, and of all the accelerative force by which that other body is impelled.—The demonſtration of this is a natural conſequence of the theorem immediately preceding.

Hence, if the one body L, by a radius drawn to the other body T, deſcribes areas proportional to the times, and from the whole force by which the firſt body L is urged, (whether that force is ſimple, or, according to Cor. 2. of the laws, compounded of ſeveral forces), we ſubduct that whole accelerative force by which the other body is urged ; the whole remaining force by which the firſt body is urged will tend to the other body T, as its centre.

And *vice verſa*, if the remaining force tends nearly to the other body T, thoſe areas will be nearly proportional to the times.

Newtonian Philoſophy.

If the body L, by a radius drawn to the other body T, deſcribes areas, which, compared with the times, are very unequal, and that other body T be either at reſt, or moves uniformly forward in a right line, the action of the centripetal force tending to that other body T is either none at all, or it is mixed and combined with very powerful actions of other forces: and the whole force compounded of them all, if they are many, is directed to another (immoveable or moveable) centre. The ſame thing obtains when the other body is actuated by any other motion whatever; provided that centripetal force is taken which remains after ſubducting that whole force acting upon that other body T.

SCHOLIUM.

Becauſe the equable deſcription of areas indicates that a centre is reſpected by that force with which the body is moſt affected, and by which it is drawn back from its rectilinear motion, and retained in its orbit, we may always be allowed to uſe the equable deſcription of areas as an indication of a centre about which all circular motion is performed in free ſpaces.

THEOR. IV. The centripetal forces of bodies which by equable motions deſcribe different circles, tend to the centres of the ſame circles; and are one to the other as the ſquares of the arcs deſcribed in equal times applied to the radii of circles.—For theſe forces tend to the centres of the circles, (by Theor. 2. and Cor. 2. Theor. 1.) and are to one another as the verſed ſines of the leaſt arcs deſcribed in equal times, (by Cor. 4. Theor. 1.) that is, as the ſquares of the ſame arcs applied to the diameters of the circles, by one of the lemmas; and therefore, ſince thoſe arcs are as arcs deſcribed in any equal times, and the diameters are as the radii, the forces will be as the ſquares of any arcs deſcribed in the ſame time, applied to the radii of the circles. Q. E. D.

COR. 1. Therefore, ſince thoſe arcs are as the velocities of the bodies, the centripetal forces are in a ratio compounded of the duplicate ratio of the velocities directly, and of the ſimple ratio of the radii inverſely.

COR. 2. And ſince the periodic times are in a ratio compounded of the ratio of the radii directly, and the ratio of the velocities inverſely; the centripetal forces are in a ratio compounded of the ratio of the radii directly, and the duplicate ratio of the periodic times inverſely.

COR. 3. Whence, if the periodic times are equal, and the velocities therefore as the radii, the centripetal forces will be alſo as the radii; and the contrary.

COR. 4. If the periodic times and the velocities are both in the ſubduplicate ratio of the radii, the centripetal forces will be equal among themſelves; and the contrary.

COR. 5. If the periodic times are as the radii, and therefore the velocities equal, the centripetal forces will be reciprocally as the radii; and the contrary.

COR. 6. If the periodic times are in the ſeſquiplicate ratio of the radii, and therefore the velocities reciprocally in the ſubduplicate ratio of the radii, the centripetal forces will be in the duplicate ratio of the radii inverſely; and the contrary.

COR. 7. And univerſally, if the periodic time is as any power R^n of the radius R, and therefore the velocity reciprocally as the power R^{n-1} of the radius, the centripetal force will be reciprocally as the power R^{2n-1} of the radius; and the contrary.

COR. 8. The ſame things all hold concerning the times, the velocities, and forces, by which bodies deſcribe the ſimilar parts of any ſimilar figures, that have their centres in a ſimilar poſition within thoſe figures, as appears by applying the demonſtrations of the preceding caſes to thoſe. And the application is eaſy, by only ſubſtituting the equable deſcription of areas in the place of equable motion, and uſing the diſtances of the bodies from the centres inſtead of the radii.

COR. 9. From the ſame demonſtration it likewiſe follows, that the arc which a body uniformly revolving in a circle by means of a given centripetal force deſcribes in any time, is a mean proportional between the diameter of the circle, and the ſpace which the ſame body, falling by the ſame given force, would deſcend through in the ſame given time.

"By means of the preceding propoſition and its corollaries (ſays Sir Iſaac), we may diſcover the proportion of a centripetal force to any other known force, ſuch as that of gravity. For if a body by means of its gravity revolves in a circle concentric to the earth, this gravity is the centripetal force of that body. But from the deſcent of heavy bodies, the time of one entire revolution, as well as the arc deſcribed in any given time, is given (by Cor. 9. of this theorem). And by ſuch propoſitions Mr Huygens, in his excellent book *De Horologio Oſcillatorio*, has compared the force of gravity with the centrifugal forces of revolving bodies.

The preceding propoſition may alſo be demonſtrated in the following manner. In any circle ſuppoſe a polygon to be inſcribed of any number of ſides. And if a body, moved with a given velocity along the ſides of the polygon, is reflected from the circle at the ſeveral angular points; the force with which, at every reflection it ſtrikes the circle, will be as its velocity: and therefore the ſum of the forces, in a given time, will be as that velocity and the number of reflections conjunctly; that is, (if the ſpecies of the polygon be given), as the length deſcribed in that given time, and increaſed or diminiſhed in the ratio of the ſame length to the radius of the circle; that is, as the ſquare of that length applied to the radius; and therefore, if the polygon, by having its ſides diminiſhed *in infinitum*, coincides with the circle, as the ſquare of the arc deſcribed in a given time applied to the radius. This is the centrifugal force, with which the body impels the circle; and to which the contrary force, wherewith the circle continually repels the body towards the centre, is equal.

On theſe principles hangs the whole of Sir Iſaac Newton's mathematical philoſophy. He now ſhows how to find the centre to which the forces impelling any body are directed, having the velocity of the body given: and finds the centrifugal force to be always as the verſed ſine of the naſcent arc directly, and as the ſquare of the time inverſely; or directly as the ſquare of the velocity, and inverſely as the chord of the naſcent arc. From theſe premiſes he deduces the method of finding the centripetal force directed to any given point when the body revolves in a circle; and this whether the central point is near or at an immenſe diſtance; ſo that all the lines drawn from it may be taken for parallels. The ſame thing he ſhows with regard to bodies revolving in ſpirals, ellipſes, hyperbolas, or parabolas.—Having the figures of the orbits given, he ſhows alſo how to find the velocities and moving powers; and, in ſhort, ſolves all the moſt difficult problems relating to the celeſtial bodies with an aſtoniſhing degree of mathematical ſkill. Theſe problems and demonſtrations are all contained in the firſt book of the *Principia:* but to give an account of them here would far exceed our limits; neither would many of them be intelligible, excepting to firſt-rate mathematicians.

16
Rules for philoſophical reaſoning.

In the ſecond book, Sir Iſaac treats of the properties of fluids, and their powers of reſiſtance; and here he lays down ſuch principles as entirely overthrow the doctrine of Des Cartes's vortices, which was the faſhionable ſyſtem in his time. In the third book, he begins particularly to treat of the natural phenomena, and apply them to the mathematical principles formerly demonſtrated; and, as a neceſſary preliminary to this part, he lays down the following rules for reaſoning in natural philoſophy.

1. We are to admit no more cauſes of natural things than ſuch as are both true and ſufficient to explain their natural appearances.

2. Therefore to the ſame natural effects we muſt always aſſign, as far as poſſible, the ſame cauſes.

3. The qualities of bodies which admit neither intenſion nor remiſſion of degrees, and which are found to belong to all bodies within the reach of our experiments, are to be eſteemed the univerſal qualities of all bodies whatſoever.

4. In experimental philoſophy, we are to look upon propoſitions collected by general induction from phenomena as accurately or very nearly true, notwithſtanding any contrary hypotheſes that may be imagined, till ſuch time as other phenomena occur, by which they may either be made more accurate, or liable to exceptions.

The phenomena firſt conſidered are, 1. That the ſatellites of Jupiter by radii drawn to the centre of their primary, deſcribe areas proportional to the times of their deſcription; and that their periodic times, the fixed ſtars being at reſt, are in the ſeſquiplicate ratio of their diſtances from its centre. 2. The ſame thing is likewiſe obſerved of the phenomena of Saturn. 3. The five primary planets, Mercury, Venus, Mars, Jupiter, and Saturn, with their ſeveral orbits encompaſs the ſun. 4. The fixed ſtars being ſuppoſed at reſt, the periodic times of the five primary planets, and of the earth, about the ſun, are in the ſeſquiplicate proportion of their mean diſtances from the ſun. 5. The primary planets, by radii drawn to the earth, deſcribe areas no ways proportionable to the times: but the areas which they deſcribe by radii drawn to the ſun are proportional to the times of deſcription. 6. The moon, by a radius drawn to the centre of the earth, deſcribes an area proportional to the time of deſcription. All theſe phenomena are undeniable from aſtronomical obſervations, and are explained at large under the article Astronomy. The mathematical demonſtrations are next applied by Sir Iſaac Newton in the following propoſitions:

Prop. I. The forces by which the ſatellites of Jupiter are continually drawn off from rectilinear motions, and retained in their proper orbits, tend to the centre of that planet; and are reciprocally as the ſquares of the diſtances of thoſe ſatellites from that centre. The former part of this propoſition appears from Theor. 2. or 3. and the latter from Cor. 6. of Theor. 4.; and the ſame thing we are to underſtand of the ſatellites of Saturn.

Prop. II. The forces by which the primary planets are continually drawn off from rectilinear motions, and retained in their proper orbits, tend to the ſun; and are reciprocally as the ſquares of the diſtances from the ſun's centre. The former part of this propoſition is manifeſt from Phenomenon 5. juſt mentioned, and from Theor. 2.; the latter from Phenomenon 4. and Cor. 6. of Theor. 4. But this part of the propoſition is with great accuracy deducible from the quieſcence of the aphelion points. For a very ſmall aberration from the reciprocal duplicate proportion would produce a motion of the apſides, ſenſible in every ſingle revolution, and in many of them enormouſly great.

Prop. III. The force by which the moon is retained in its orbit, tends towards the earth; and is reciprocally as the ſquare of the diſtance of its place from the centre of the earth. The former part of this propoſition is evident from Phenom. 5. and Theor. 2.; the latter from Phenom. 6. and Theor. 2. or 3. It is alſo evident from the very ſlow motion of the moon's apogee; which, in every ſingle revolution, amounting but to 3° 3′ *in conſequentia*, may be neglected: and this more fully appears from the next propoſition.

Prop. IV. The moon gravitates towards the earth, and by the force of gravity is continually drawn off from a rectilinear motion, and retained in its orbit.—The mean diſtance of the moon from the earth in the ſyzigies in ſemidiameters of the latter, is about $60\frac{1}{2}$. Let us aſſume the mean diſtance of 60 ſemidiameters in the ſyzigies; and ſuppoſe one revolution of the moon in reſpect of the fixed ſtars to be completed in 27^{d}. 7^{h}. 43′, as aſtronomers have determined; and the circumference of the earth to amount to 123,249,600 Paris feet. Now, if we imagine the moon, deprived of all motion, to be let go, ſo as to deſcend towards the earth with the impulſe of all that force by which it is retained in its orbit, it will, in the ſpace of one minute of time, deſcribe in its fall $15\frac{1}{2}$ Paris feet. For the verſed ſine of that arc which the moon, in the ſpace of one minute of time, deſcribes by its mean motion at the diſtance of 60 ſemidiameters of the earth, is nearly $15\frac{1}{12}$ Paris feet; or more accurately, 15 feet 1 inch and one line $\frac{4}{9}$. Wherefore ſince that force, in approaching to the earth, increaſes in the reciprocal duplicate proportion of the diſtance; and, upon that account, at the ſurface of the earth is 60x60 times greater than that at the moon; a body in our regions, falling with that force, ought, in the ſpace of one minute of time, to deſcribe $60\times60\times15\frac{1}{12}$ Paris feet; and in the ſpace of one ſecond of time to deſcribe $15\frac{1}{12}$ of thoſe feet; or, more accurately, 15 feet 1 inch, Newtonian hiloſophy.

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1 inch, 1 line $\frac{4}{9}$. And with this very force we actually find that bodies here on earth do really deſcend.—For a pendulum oſcillating ſeconds in the latitude of Paris, will be three Paris feet and $8\frac{1}{2}$ lines in length, as Mr Huygens has obſerved. And the ſpace which a heavy body deſcribes by falling one ſecond of time is to half the length of the pendulum in the duplicate ratio of the circumference of the circle to its diameter; and is therefore 15 Paris feet, 1 inch 1 line $\frac{7}{9}$. And therefore the force by which the moon is retained in its orbit, becomes at the very ſurface of the earth, equal to the force of gravity which we obſerve in heavy bodies there. And therefore (by Rule 1. and 2.) the force by which the moon is retained in its orbit is that very ſame force which we commonly call *gravity*. For were gravity another force different from that, then bodies deſcending to the earth with the joint impulſe of both forces would fall with a double velocity, and, in the ſpace of one ſecond of time, would deſcribe $30\frac{1}{6}$ Paris feet; altogether againſt experience.

The demonſtration of this propoſition may be more diffuſely explained after the following manner: Suppoſe ſeveral moons to revolve about the earth, as in the ſyſtem of Jupiter or Saturn, the periodic times of thoſe moons would (by the argument of induction) obſerve the ſame law which Kepler found to obtain among the planets; and therefore their centripetal forces would be reciprocally as the ſquares of the diſtances from the centre of the earth, by Prop. I. Now, if the loweſt of theſe were very ſmall, and were ſo near the earth as almoſt to touch the tops of the higheſt mountains, the centripetal force thereof, retaining it in its orbit, would be very nearly equal to the weights of any terreſtrial bodies that ſhould be found upon the tops of theſe mountains; as may be known from the foregoing calculation. Therefore, if the ſame little moon ſhould be deſerted by its centrifugal force that carries it through its orbit, it would deſcend to the earth; and that with the ſame velocity as heavy bodies do actually deſcend with upon the tops of thoſe very mountains, becauſe of the equality of forces that oblige them both to deſcend. And if the force by which that loweſt moon would deſcend were different from that of gravity, and if that moon were to gravitate towards the earth, as we find terreſtrial bodies do on the tops of mountains, it would then deſcend with twice the velocity, as being impelled by both theſe forces conſpiring together. Therefore, ſince both theſe forces, that is, the gravity of heavy bodies, and the centripetal forces of the moons, reſpect the centre of the earth, and are ſimilar and equal between themſelves, they will (by Rule 1. and 2.) have the ſame cauſe. And therefore the force which retains the moon in its orbit, is that very force which we commonly call *gravity*; becauſe otherwiſe, this little moon at the top of a mountain muſt either be without gravity, or fall twice as ſwiftly as heavy bodies uſe to do.

Having thus demonſtrated that the moon is retained in its orbit by its gravitation towards the earth, it is eaſy to apply the ſame demonſtration to the motions of the other ſecondary planets, and of the primary planets round the ſun, and thus to ſhow that gravitation prevails throughout the whole creation; after which, Sir Iſaac proceeds to ſhow from the ſame principles that the heavenly bodies gravitate towards each other, and contain different quantities of matter, or have different denſities in proportion to their bulks.

Prop. V. All bodies gravitate towards every planet; and the weights of bodies towards the ſame planet, at equal diſtances from its centre, are proportional to the quantities of matter they contain.

It has been confirmed by many experiments, that all ſorts of heavy bodies (allowance being made for the inequality of retardation by ſome ſmall reſiſtance of the air,) deſcend to the earth from equal heights in equal times; and that equality of times we may diſtinguiſh to a great accuracy by the help of pendulums. Sir Iſaac Newton tried the thing in gold, ſilver, lead, glaſs, ſand, common ſalt, wood, water, and wheat. He provided two wooden boxes, round and equal; filled the one with wood, and ſuſpended an equal weight of gold in the centre of oſcillation of the other. The boxes hanging by equal threads of 11 feet, made a couple of pendulums, perfectly equal in weight and figure, and equally receiving the reſiſtance of the air. And placing the one by the other, he obſerved them to play together forwards and backward, for a long time, with equal vibrations. And therefore the quantity of matter in the gold was to the quantity of matter in the wood, as the action of the motive force (or *vis motrix*) upon all the gold, to the action of the ſame upon all the wood; that is, as the weight of the one to the weight of the other. And the like happened in the other bodies. By theſe experiments, in bodies of the ſame weight, he could manifeſtly have diſcovered a difference of matter leſs than the thouſandth part of the whole, had any ſuch been. But without all doubt, the nature of gravity towards the planets, is the ſame as towards the earth. For ſhould we imagine our terreſtrial bodies removed to the orb of the moon, and there, together with the moon, deprived of all motion, to be let go, ſo as to fall together towards the earth; it is certain, from what we have demonſtrated before, that in equal times, they would deſcribe equal ſpaces with the moon, and of conſequence are to the moon in quantity of matter, as their weights to its weight. Moreover, ſince the ſatellites of Jupiter perform their revolutions in times which obſerve the ſeſquiplicate proportion of their diſtances from Jupiter's centre, their accelerative gravities towards Jupiter will be reciprocally as the ſquares of their diſtances from Jupiter's centre; that is, equal at equal diſtances. And therefore, theſe ſatellites, if ſuppoſed to fall towards Jupiter from equal heights, would deſcribe equal ſpaces in equal times, in like manner as heavy bodies do on our earth. And by the ſame argument if the circumſolar planets were ſuppoſed to be let fall at equal diſtances from the ſun, they would, in their deſcent towards the ſun, deſcribe equal ſpaces in equal times. But forces, which equally accelerate unequal bodies, muſt be as thoſe bodies: that is to ſay, the weights of the planets towards the ſun muſt be as their quantities of matter. Further, That the weights of Jupiter and his ſatellites towards the ſun are proportional to the ſeveral quantities of their matter, appears from the exceeding regular motions of the ſatellites. For if ſome of theſe bodies were more ſtrongly attracted to the ſun in proportion to their quantity of matter than others, the motions of the ſatellites would be diſturbed by that inequality of attraction. If, at equal diſtances from the ſun, any ſatellite, in proportion to the quantity of its matter, did gravitate towards the ſun, with a force greater than Jupiter in proportion to his, according to any given proportion, ſuppoſe of *d* to *e*; then the diſtance between the centres of the ſun and of the ſatellite's orbit would be always greater than the diſtance between the centres of the ſun and of Jupiter nearly in the ſubduplicate of that proportion. And if the ſatellite gravitated towards the ſun with a force leſs in the proportion of *e* to *d*, the diſtance of the centre of the ſatellite's orb from the ſun would be leſs than the diſtance of the centre of Jupiter's from the ſun in the ſubduplicate of the ſame proportion. Therefore, if, at equal diſtances from the ſun, the accelerative gravity of any ſatellite towards the ſun were greater or leſs than the accelerating gravity of Jupiter towards the ſun but by $\frac{1}{1000}$ part of the whole gravity; the diſtance of the centre of the ſatellite's orbit from the ſun would be greater or leſs than the diſtance of Jupiter from the ſun by $\frac{1}{2000}$ part of the whole diſtance; that is, by a fifth part of the diſtance of the utmoſt ſatellite from the centre of Jupiter; an eccentricity of the orbit which would be very ſenſible. But the orbits of the ſatellites are concentric to Jupiter; therefore the accelerative gravities of Jupiter, and of all its ſatellites, towards the ſun, are equal among themſelves. And by the ſame argument, the weight of Saturn and of his ſatellites towards the ſun, at equal diſtances from the ſun, are as their ſeveral quantities of matter; and the weights of the moon and of the earth towards the ſun, are either none, or accurately proportional to the maſſes of matter which they contain.

But further, the weights of all the parts of every planet towards any other planet are one to another as the matter in the ſeveral parts. For if ſome parts gravitated more, others leſs, than in proportion to the quantity of their matter; then the whole planet, according to the ſort of parts with which it moſt abounds, would gravitate more or leſs than in proportion to the quantity of matter in the whole. Nor is it of any moment whether theſe parts are external or internal. For if, as an inſtance, we ſhould imagine the terreſtrial bodies with us to be raiſed up to the orb of the moon, to be there compared with its body; if the weights of ſuch bodies were to the weights of the external parts of the moon as the quantities of matter in the one and in the other reſpectively, but to the weights of the internal parts in a greater or leſs proportion; then likewiſe the weights of thoſe bodies would be to the weight of the whole moon in a greater or leſs proportion; againſt what we have ſhowed above.

Cor. 1. Hence the weights of bodies do not depend upon their forms and textures. For if the weights could be altered with the forms, they would be greater or leſs, according to the variety of forms in equal matter; altogether againſt experience.

Cor. 2. Univerſally, all bodies about the earth gravitate towards the earth; and the weights of all, at equal diſtances from the earth's centre, are as the quantities of matter which they ſeverally contain. This is the quality of all bodies within the reach of our experiments; and therefore (by Rule 3.) to be affirmed of all bodies whatſoever. If ether, or any other body, were either altogether void of gravity, or were to gravitate leſs in proportion to its quantity of matter; then, becauſe (according to Ariſtotle, Des Cartes, and others) there is no difference betwixt that and other bodies, but in mere form of matter, by a ſucceſſive change from form to form, it might be changed at laſt into a body of the ſame condition with thoſe which gravitate moſt in proportion to their quantity of matter; and, on the other hand, the [illegible]vieſt bodies, acquiring the firſt form of that body, might by degrees quite loſe their gravity. And therefore the weights would depend upon the forms of bodies, and with thoſe forms might be changed, contrary to what was proved in the preceding corollary.

Cor. 3. All ſpaces are not equally full. For if all ſpaces were equally full, then the ſpecific gravity of the fluid which fills the region of the air, on account of the extreme denſity of the matter, would fall nothing ſhort of the ſpecific gravity of quickſilver or gold, or any other the moſt denſe body; and therefore, neither gold, nor any other body, could deſcend in air. For bodies do not deſcend in fluids, unleſs they are ſpecifically heavier than the fluids. And if the quantity of matter in a given ſpace can by any rarefaction be diminiſhed, what ſhould hinder a diminution to infinity?

Cor. 4. If all the ſolid particles of all bodies are of the ſame denſity, nor can be rarefied without pores, a void ſpace or vacuum muſt be granted. [By bodies of the ſame denſity, our author means thoſe whoſe *vires inertiæ* are in the proportion of their bulks.]

Prop. VI. That there is a power of gravity tending to all bodies, proportional to the ſeveral quantities of matter which they contain.

That all the planets mutually gravitate one towards another, we have proved before; as well as that the force of gravity towards every one of them, conſidered apart, is reciprocally as the ſquare of the diſtance of places from the centre of the planet. And thence it follows, that the gravity tending towards all the planets is proportional to the matter which they contain.

Moreover, ſince all the parts of any planet *A* gravitate towards any other planet *B*, and the gravity of every part is to the gravity of the whole as the matter of the part to the matter of the whole; and (by Law 3.) to every action correſponds an equal re-action: therefore the planet *B* will, on the other hand, gravitate towards all the parts of the planet *A*; and its gravity towards any one part will be to the gravity towards the whole, as the matter of the part to the matter of the whole. *Q. E. D.*

Cor. 1. Therefore the force of gravity towards any whole planet, ariſes from, and is compounded of, the forces of gravity towards all its parts. Magnetic and electric attractions afford us examples of this. For all attraction towards the whole ariſes from the attractions towards the ſeveral parts. The thing may be eaſily underſtood in gravity, if we conſider a greater planet as formed of a number of leſſer planets, meeting together in one globe. For hence it would appear that the force of the whole muſt ariſe from the forces of the component parts. If it be objected, that, according to this law, all bodies with us muſt mutually gravitate one towards another, whereas no ſuch gravitation anywhere appears; it is anſwered, that, ſince the gravitation towards theſe bodies is to the gravitation towards the whole earth, as theſe bodies are to the whole earth, the gravitation towards them muſt be far leſs than to ewtonian ilosophy.

fall under the obſervation of our ſenſes. [The experiments with regard to the attraction of mountains, however, have now further elucidated this point.]

Cor. 2. The force of gravity towards the ſeveral equal particles of any body, is reciprocally as the ſquare of the diſtance of places from the particles.

Prop. VII. In two ſpheres mutually gravitating each towards the other, if the matter, in places on all ſides round about and equidiſtant from the centres, is ſimilar; the weight of either ſphere towards the other will be reciprocally as the ſquare of the diſtance between their centres.

For the demonſtration of this, ſee the *Principia*, Book I. Prop. lxxv. and lxxvi.

Cor. 1. Hence we may find and compare together the weights of bodies towards different planets. For the weights of bodies revolving in circles about planets are as the diameters of the circles directly, and the ſquares of their periodic times reciprocally; and their weights at the ſurfaces of the planets, or at any other diſtances from their centres, are (by this prop.) greater or leſs, in the reciprocal duplicate proportion of the diſtances. Thus from the periodic times of Venus, revolving about the ſun, in 224d. 16$\frac{3}{4}$h.; of the utmoſt circumjovial ſatellite revolving about Jupiter, in 16d. 16$\frac{8}{15}$h.; of the Huygenian ſatellite about Saturn in 15d. 22$\frac{2}{3}$h.; and of the moon about the earth in 27d. 7h. 43′; compared with the mean diſtance of Venus from the ſun, and with the greateſt heliocentric elongations of the outmoſt circumjovial ſatellite from Jupiter's centre, 8′ 16″; of the Huygenian ſatellite from the centre of Saturn, 3′ 4″; and of the moon from the earth, 10′ 33″; by computation our author found, that the weight of equal bodies, at equal diſtances from the centres of the ſun, of Jupiter, of Saturn, and of the earth, towards the ſun, Jupiter, Saturn, and the earth, were one to another as $\frac{1}{1067}$, $\frac{1}{3021}$, and $\frac{1}{169282}$ reſpectively. Then, becauſe as the diſtances are increaſed or diminiſhed, the weights are diminiſhed or increaſed in a duplicate ratio; the weights of equal bodies towards the ſun, Jupiter, Saturn, and the earth, at the diſtances 10000, 997, 791, and 109, from their centres, that is, at their very ſuperficies, will be as 10000, 943, 529, and 435 reſpectively.

Cor. 2. Hence likewiſe we diſcover the quantity of matter in the ſeveral planets. For their quantities of matter are as the forces of gravity at equal diſtances from their centres, that is, in the ſun, Jupiter, Saturn, and the earth, as 1, $\frac{1}{1067}$, $\frac{1}{3021}$, and $\frac{1}{169282}$, reſpectively. If the parallax of the ſun be taken greater or leſs than 10″ 30‴, the quantity of matter in the earth muſt be augmented or diminiſhed in the triplicate of that proportion.

Cor. 3. Hence alſo we find the denſities of the planets. For (by Prop. lxxii. Book I.) the weights of equal and ſimilar bodies towards ſimilar ſpheres, are, at the ſurfaces of thoſe ſpheres, as the diameters of the ſpheres. And therefore the denſities of diſſimilar ſpheres are as thoſe weights applied to the diameters of the ſpheres. But the true diameters of the ſun, Jupiter, Saturn, and the earth, were one to another as 10000, 997, 791, and 109; and the weights towards the ſame, as 10000, 943, 529, and 435 reſpectively; and therefore their denſities are as 100, 94$\frac{1}{2}$, 67, and 400. The denſity of the earth, which comes out by this computation, does not depend upon the parallax of the ſun, but it is determined by the parallax of the moon, and therefore is here truly defined. The ſun therefore is a little denſer than Jupiter, and Jupiter than Saturn, and the earth four times denſer than the ſun; for the ſun, by its great heat, is kept in a ſort of a rarefied ſtate. The moon alſo is denſer than the earth.

Newtonian Philoſophy. Newton.

Cor. 4. The ſmaller the planets are, they are, *cæteris paribus*, of ſo much the greater denſity. For ſo the powers of gravity on their ſeveral ſurfaces come nearer to equality. They are likewiſe, *cæteris paribus*, of the greater denſity as they are nearer to the ſun. So Jupiter is more denſe than Saturn, and the earth than Jupiter. For the planets were placed at different diſtances from the ſun, that, according to their degrees of denſity, they might enjoy a greater or leſs proportion of the ſun's heat. Our water, if it were removed as far as the orb of Saturn, would be converted into ice, and in the orb of Mercury would quickly fly away in vapour. For the light of the ſun, to which its heat is proportional, is ſeven times denſer in the orb of Mercury than with us: and by the thermometer Sir Iſaac found, that a ſevenfold heat of our ſummer ſun will make water boil. Nor are we to doubt, that the matter of Mercury is adapted to its heat, and is therefore more denſe than the matter of our earth; ſince, in a denſer matter, the operations of nature require a ſtronger heat.

It is ſhown in the ſcholium of Prop. xxii. Book II. of the *Principia*, that, at the height of 200 miles above the earth, the air is more rare than it is at the ſuperficies of the earth, in the ratio of 30 to 0,0000000000003998, or as 75,000000000000 to 1 nearly. And hence the planet Jupiter, revolving in a medium of the ſame denſity with that ſuperior air, would not loſe by the reſiſtance of the medium the 1000000th part of its motion in 1000000 years. In the ſpaces near the earth, the reſiſtance is produced only by the air, exhalations, and vapours. When theſe are carefully exhauſted by the air pump from under the receiver, heavy bodies fall within the receiver with perfect freedom, and without the leaſt ſenſible reſiſtance; gold itſelf, and the lighteſt down, let fall together, will deſcend with equal velocity; and though they fall through a ſpace of four, ſix, and eight feet, they will come to the bottom at the ſame time; as appears from experiments that have often been made. And therefore the celeſtial regions being perfectly void of air and exhalations, the planets and comets meeting no ſenſible reſiſtance in thoſe ſpaces, will continue their motions through them for an immenſe ſpace of time.

Newton (Richard) D. D. the founder of Hertford college, is a man of whom we regret that we can give but a ſuperficial and rather a vague account. By one writer he is ſaid to have been a Northamptonſhire gentleman; by another, we are told that his father enjoyed at Lavendon Grange in Bucks a moderate eſtate, which is ſtill in the family, though he lived in a houſe of Lord Northampton's in Yardley-Chaſe, where in 1675 our doctor was born. All agree that the family from which he ſprung had long been reſpectable, though its fortunes had been much injured during the great rebellion.

The ſubject of this article was educated at Weſtminſter ſchool, and from that foundation elected to a ſtudentſhip of Chriſt-Church, Oxford. At what age he was admitted into the univerſity we have no certain information; but in the liſt of graduates he is thus diſtinguiſhed: "Newton (Richard,) Chriſt-church, M. A. April 12. 1701; B. D. March 18. 1707; Hart-hall, D. D. December 7. 1710." He was appointed a tutor in Chriſt-church as ſoon as he was of the requiſite ſtanding in his college, and diſcharged the duties of that important office with honour to himſelf and advantage to the ſociety of which he was a member. From Oxford he was called (we know not at what preciſe period) into Lord Pelham's family, to ſuperintend the education of the late duke of Newcaſtle and his brother Mr Pelham; and by both theſe illuſtrious perſons he was ever remembered with the moſt affectionate regard. In 1710 he was by Dr Aldrich, the celebrated dean of Chriſt-church, inducted principal of Hart-hall, which was then an appendage to Exeter college. From this ſtate of dependance Dr Newton wreſted it againſt much oppoſition, eſpecially from the learned Dr Conybeare, afterwards dean of Chriſt-church and biſhop of Briſtol. In no conteſt, it has been obſerved, were ever two men more equally matched; and the papers that paſſed between them, like Junius's letters, deſerved to be collected for the energetic beauty of their ſtyle and the ingenuity of their arguments. Dr Newton, however, proved ſucceſsful; and in 1740 obtained a charter, converting Hart-hall into Hertford college; of which, at a conſiderable expence to himſelf, and with great aid from his numerous friends, he was thus the founder and firſt head.

Though this excellent man was Mr Pelham's tutor, and, if report be true, had by him been more than once employed to furniſh king's ſpeeches, he never received the ſmalleſt preferment from his pupil when firſt miniſter: and when that ſtateſman was aſked, why he did not place in a proper ſtation the able and meritorious Dr Newton? his reply was, "How could I do it? he never aſked me." He was not, however, neglected by all the great. Dr Compton, biſhop of London, who had a juſt ſenſe of his merits, had, at an early period of his life, collated him to the rectory of Sudbury in the county of Northampton, which he held together with the headſhip of Hart-hall. He reſided for ſome years on that living, and diſcharged all the parts of his office with exemplary care and fidelity. Amongſt other particulars he read the prayers of the liturgy in his church at ſeven o'clock in the evening of every week-day (hay-time and harveſt excepted), for the benefit of ſuch of his pariſhioners as could then aſſemble for public devotion. When he left the place, returning again to Oxford about 1724, he enjoined his curates to obſerve the ſame pious practice; and was fortunate enough to have three ſucceſſively who trode in the ſteps of their worthy principal. Being always an enemy to pluralities with cure of ſouls, he exerted his utmoſt endeavours from time to time with Dr Gibſon, Biſhop Compton's ſucceſſor in the ſee of London, for leave to reſign his rectory in favour of his curate. To the reſignation his lordſhip could have no objection; but being under ſome kind of engagement to confer the living on another, Dr Newton retained it himſelf, but beſtowed all the emoluments upon works of charity in the pariſh, and curates who ſo faithfully diſcharged their duty. Dr Sherlock, who ſucceeded Biſhop Gibſon, being under no engagement of a like nature, very readily granted Dr Newton's requeſt, by accepting his reſignation, and collating to the rectory Mr Saunders, who was the laſt of his curates. Upon a vacancy of the public orator's place at Oxford, the head of Hertford college offered himſelf a candidate; but as the race is not always to the ſwift, nor the battle to the ſtrong, Dr Digby Coates carried the point againſt him. He was afterwards promoted to a canonry of Chriſt-church, but did not long enjoy it; for in April 1753 death deprived the world of this excellent man in the 78th year of his age.

He was allowed to be as polite a ſcholar, and as accompliſhed a gentleman, as almoſt any of the age in which he lived. In cloſeneſs of argument, and perſpicuity of ſtyle, he had no ſuperior. Never was any private perſon employed in more truſts, nor were truſts ever diſcharged with greater integrity. He was a zealous friend to religion, the univerſity, the clergy, and the poor; and ſuch was his liberality of ſentiment, that he admitted to his friendſhip every man, whatever might be his religious creed, who was earneſtly employed in the ſame good works with himſelf—the promotion of virtue and unaffected piety. Of his works we have ſeen only his *Theophraſtus*, which was publiſhed after his death; and his *Pluralities Indefenſible*; but he publiſhed ſeveral other things during his life, and left a volume of ſermons prepared for the preſs at his death.

Newton (Thomas), late lord biſhop of Briſtol and dean of St Paul's, London, was born on the firſt of January 1704. His father, John Newton, was a conſiderable brandy and cyder merchant, who, by his induſtry and integrity, having acquired what he thought a competent fortune, left off trade ſeveral years before he died.

He received the firſt part of his education in the free ſchool of Litchfield; a ſchool which, the biſhop obſerves with ſome kind of exultation, had at all times ſent forth ſeveral perſons of note and eminence; from Biſhop Smaldridge and Mr Wollaſton, to Dr Johnſon and Mr Garrick.

From Litchfield he was removed to Weſtminſter ſchool, in 1717, under the care of Dr Friend and Dr Nicoll.

During the time he was at Weſtminſter, there were, he obſerves, more young men who made a diſtinguiſhed figure afterwards in the world, than perhaps at any other period, either before or ſince. He particularly mentions William Murray, the late earl of Mansfield, with whom he lived on terms of the higheſt friendſhip to the laſt.

He continued ſix years at Weſtminſter ſchool, five of which he paſſed in the college. He afterwards went to Cambridge, and entered at Trinity college. Here he conſtantly reſided eight months at leaſt in every year, till he had taken his Bachelor of Arts degree. Being choſen Fellow of his college, he came afterwards to ſettle in London. As it had been his inclination from a child, and as he was alſo deſigned for holy orders, he had ſufficient time to prepare himſelf, and compoſed ſome ſermons, that he might have a ſtock in hand when he entered on the miniſtry. His title for orders was his fellowſhip; and he was ordained deacon in December 1729, and prieſt in the February following, by Biſhop Gibſon.

At his firſt ſetting out in his office, he was curate at St George's, Hanover-ſquare; and continued for ſeveral years aſſiſtant preacher to Dr Trebeck. His firſt preferment was that of reader and afternoon preacher at Groſvenor Chapel, in South Audley ſtreet.

This introduced him to the family of Lord Tyrconnel, to whoſe ſon he became tutor. He continued in this ſituation for many years, very much at his eaſe, and on terms of great intimacy and friendſhip with Lord and Lady Tyrconnel, "without ſo much (ſays he) as an unkind word or a cool look ever intervening."

In the ſpring of 1744, he was, through the intereſt of the earl of Bath (who was his great friend and patron, and whoſe friendſhip and patronage were returned by grateful acknowledgments and the warmeſt encomiums), preſented to the rectory of St Mary le Bow; ſo that he was 40 years old before he obtained any living.

At the commencement of 1745, he took his doctor's degree. In the ſpring of 1747 he was choſen lecturer of St George's, Hanover-ſquare, by a moſt reſpectable veſtry of noblemen and gentlemen of high diſtinction. In Auguſt following he married his firſt wife, the eldeſt daughter of Dr Trebeck; an unaffected, modeſt, decent young woman, with whom he lived very happy in mutual love and harmony near ſeven years.

In 1749 he publiſhed his edition of Milton's Paradiſe Loſt, which (ſays he, very modeſtly) it is hoped hath not been ill received by the public, having, in 1775, gone through eight editions. After the Paradiſe Loſt, it was judged (ſays he) proper that Dr Newton ſhould alſo publiſh the Paradiſe Regained, and other poems of Milton; but theſe things he thought detained him from other more material ſtudies, though he had the good fortune to gain by them more than Milton did by all his works put together. But his greateſt gain (he ſays) was their firſt introducing him to the friendſhip and intimacy of two ſuch men as Biſhop Warburton and Dr Jortin, whoſe works will ſpeak for them better than any private commendation.

In 1754 he loſt his father, at the age of 83; and within a few days his wife, at the age of 38. This was the ſevereſt trial he ever underwent, and almoſt overwhelmed him. At that time he was engaged in writing his Diſſertations on the Prophecies; and happy it was for him: for in any affliction he never found a better or more effectual remedy than plunging deep into ſtudy, and fixing his thoughts as intenſely as he poſſibly could upon other ſubjects. The firſt volume was publiſhed the following winter; but the other did not appear till three years afterwards; and as a reward for his paſt and an incitement to future labours, he was appointed, in the mean time, to preach Boyle's lecture. The biſhop informs us, that 1250 copies of the Diſſertations were taken at the firſt impreſſion, and 1000 at every other edition: and "though (ſays he) ſome things have been ſince publiſhed upon the ſame ſubjects, yet they ſtill hold up their head above water, and having gone through five editions, are again prepared for another. Abroad, too, their reception hath not been unfavourable, if accounts from thence may be depended upon." They were tranſlated into the German and Daniſh languages; and received the warmeſt encomiums from perſons of learning and rank.

In the ſpring of 1757, he was made prebendary of Weſtminſter, in the room of Dr Green, and promoted to the deanery of Saliſbury. In October following, he he was made ſub-almoner to his majeſty. This he owed to Biſhop Gilbert. He married a ſecond wife in September 1761. She was the widow of the Rev. Mr Hand, and daughter of John Lord Viſcount Liſburn. In the ſame month he kiſſed his majeſty's hand for his biſhopric.

In the winter of 1764, Dr Stone, the primate of Ireland, died. Mr Grenville ſent for Biſhop Newton, and in the moſt obliging manner deſired his acceptance of the primacy. Having maturely weighed the matter in his mind, he declined the offer.

In 1768 he was made dean of St Paul's. His ambition was now fully ſatisfied; and he firmly reſolved never to aſk for any thing more.

From this time to his death, ill health was almoſt his conſtant companion. It was wonderful that ſuch a poor, weak, and ſlender thread as the biſhop's life, ſhould be ſpun out to ſuch an amazing length as it really was. In the autumn of 1781 (uſually the moſt favourable part of the year to him) he laboured under repeated illneſſes: and on Saturday the 9th of February 1782, he began to find his breath much affected by the froſt. His complaints grew worſe and worſe till the Thurſday following. He got up at five o'clock, and was placed in a chair by the fire; complained to his wife how much he had ſuffered in bed, and repeated to himſelf that portion of the Pſalms, "O my God, I cry unto thee in the day time," &c. &c. About ſix o'clock he was left by his apothecary in a quiet ſleep. Between ſeven and eight he awoke, and appeared rather more eaſy, and took a little refreſhment. He continued dozing till near nine, when he ordered his ſervant to come and dreſs him, and help him down ſtairs. As ſoon as he was dreſſed, he inquired the hour, and bid his ſervant open the ſhutter and look at the dial of St Paul's. The ſervant anſwered, it was upon the ſtroke of nine. The biſhop made an effort to take out his watch, with an intent to ſet it; but ſunk down in his chair, and expired without a ſigh or the leaſt viſible emotion, his countenance ſtill retaining the ſame placid appearance which was ſo peculiar to him when alive. Of his numerous works, his Diſſertations on the Prophecies are by much the moſt valuable. His learning was undoubtedly very conſiderable; but he ſeldom exhibits evidence of a very vigorous mind. On one occaſion, indeed, he appears to have thought with freedom; for we believe he was the firſt dignitary of the church of England who avowed his belief of the final reſtitution of all things to harmony and happineſs.

NEWTYA, a port little known, on the coaſt between Goa the capital of the Portugueſe ſettlements in India, and the Engliſh ſettlement of Bombay. Mr Rennel conjectures it to be the *Nitrias* of Pliny; near which the pirates cruized for the Roman ſhip. The ſame writer places it near to 15° 52′ 30″ North Latitude, and 73° 16′ 30″ Eaſt Longitude.

NEXI, among the Romans, perſons free born, who for debt were reduced to a ſtate of ſlavery. By the laws of the twelve tables it was ordained, that inſolvent debtors ſhould be given up to their creditors to be bound in fetters and cords, whence they were called *Nexi*; and though they did not entirely loſe the rights of freemen, yet they were often treated more harſhly than the ſlaves themſelves. If any one was indebted to ſeveral perſons, and could not within ſixty days find a cautioner, his body according to ſome, but according to others his effects, might be cut in pieces, and divided among his creditors. This latter opinion ſeems by much the moſt probable, as Livy mentions a law by which creditors had a right to attach the goods but not the perſons of their debtors.

NEYTRECHT, a town of Upper Hungary, capital of a county of the ſame name, with a biſhop's ſee; ſeated on the river *Neitra*, 40 miles north-eaſt of Preſburg. E. Long. 17. 49. N. Lat. 48. 28.

NGAN-KING-FOU, a city of China, and capital of the weſtern part of the province of Kiang-nan. It is governed by a particular viceroy, who keeps a large garriſon in a fort built on the banks of the river Yang-tſe-kiang. Its ſituation is delightful; its commerce and riches render it very conſiderable; and every thing that goes from the ſouthern part of China to Nan-king muſt paſs through it. All the country belonging to it is level, pleaſant, and fertile. It has under its juriſdiction only ſix cities of the third claſs.

NGO-KIA, a Chineſe drug, of which the compoſition will no doubt appear as ſingular as the numerous properties aſcribed to it. In the province Chang-tong, near Ngo-hien, a city of the third claſs, is a well formed by nature, which is reckoned to be ſeventy feet in depth, and which has a communication, as the Chineſe ſay, with ſome ſubterranean lake, or other large reſervoir. The water drawn from it is exceedingly clear, and much heavier then common; and if it be mixed with muddy water, it purifies it and renders it limpid, by precipitating all its impurities to the bottom of the veſſel. This water is employed in making the ngo-kia, which is nothing elſe but a kind of glue procured from the ſkin of a black aſs.

The animal is killed and flayed, and the ſkin is ſteeped for five days in water drawn from this well. At the end of that time, it is taken out to be ſcraped and cleaned; it is afterwards cut into ſmall pieces, which are boiled over a ſlow fire, in the ſame kind of water, until it is reduced to a jelly, which is ſtrained, while warm, through a cloth, to free it from all the groſs matter which could not be melted. When this glue is cool, and has acquired a conſiſtence, it is formed into ſquare cakes, upon which the Chineſe imprint characters and coats of arms, or the ſigns of their ſhops.

This well is the only one of the kind in China; it is always ſhut, and ſealed by the governor of the place with his own ſeal, until the cuſtomary day of making the emperor's glue. This operation generally laſts from the autumnal harveſt till the month of March. During that time, the neighbouring people and merchants treat for the purchaſe of the glue with thoſe who guard the well, and with the people who make it. The latter manufacture as much of it as they can, on their own account, with this difference, that it is not ſo pure, and that they are leſs ſcrupulous in examining whether the aſs be fat, or of a very black colour: however, all the glue made here is as much eſteemed at Peking as that which the mandarins who are on the ſpot tranſmit to court and to their friends.

As this drug is in the greateſt requeſt, and as the quantity of it made at Ngo-hien is not ſufficient to ſupply the whole empire, there are not wanting people who counterfeit it elſewhere, and who manufacture a ſpurious kind from the ſkins of mules, horſes, and camels, and ſometimes even from old boots; it is, however, very eaſy to diſtinguiſh that which is genuine; it has neither a bad ſmell nor a diſagreeable taſte when applied to the mouth; it is brittle and friable, and always of a deep black colour, ſometimes inclining to red. The qualities of the counterfeit kind are entirely different; both its taſte and ſmell are diſagreeable, and it is viſcous and flabby even when made of the ſkin of a hog, which is that which imitates the true kind the beſt.

The Chineſe attribute a great number of virtues to this drug. They aſſure us that it diſſolves phlegm, facilitates the play and elaſticity of the lungs, gives a free reſpiration to thoſe who breathe with difficulty; that it comforts the breaſt, increaſes the blood, ſtops dyſenteries, provokes urine, and ſtrengthens children in the womb. Without warranting the truth of all theſe properties, it appears, at leaſt, certain, by the teſtimony of the miſſionaries, that this drug is ſerviceable in all diſeaſes of the lungs. It is taken with a decoction of ſimples, and ſometimes in powder, but very ſeldom.

NIAGARA, a fort of North America, which was taken from the French in 1759, and ſtill remains in poſſeſſion of the Britiſh government. To the author of the American Geography this ſeems to give great offence; probably becauſe the fort in a manner commands all the interior parts of the continent; is a key to the north-weſtern territories of the United States; and is ſurrounded by the *Six Nations* of Indians, with whom the Engliſh have been long in alliance. It is ſituated on a ſmall peninſula formed by the river Niagara, as it flows into the lake Ontario. About ſix leagues from the fort is the greateſt cataract in the world, know by the name of the *Waterfall of Niagara*. The river at this fall runs from SSE to NNW; and the rock of the fall croſſes it not in a right line, but forms a kind of figure like a hollow ſemicircle or horſe ſhoe. Above the fall, in the middle of the river, is an iſland about 800 or 1000 feet long; the lower end of which is juſt at the perpendicular edge of the fall. On both ſides of this iſland runs all the water that comes from the lakes of Canada; viz. Lake Superior, Lake Miſchigan, Lake Huron, and Lake Erie, which have ſome large rivers that open themſelves into them. Before the water comes to this iſland, it runs but ſlowly compared with its motion afterwards, when it grows the moſt rapid in the world, running with a ſurpriſing ſwiftneſs before it comes to the fall. It is perfectly white, and in many places is thrown high up into the air. The water that runs down on the weſt ſide is more rapid, in greater abundance, and whiter, than that on the eaſt ſide; and ſeems almoſt to outfly an arrow in ſwiftneſs. When you are at the fall, and look up the river, you may ſee that the water is everywhere exceedingly ſteep, almoſt like the ſide of an hill; but when you come to look at the fall itſelf, it is impoſſible to expreſs the amazement it occaſions. The height of it, as meaſured by mathematical inſtruments, is found to be exactly 137 feet; and when the water is come to the bottom, it jumps back to a very great height in the air. The noiſe may be heard at the diſtance of 45 miles, but ſeldom further; nor can it be heard even at Fort Niagara, which is only ſix leagues diſtant, unleſs Lake Ontario is calm. At that fort it is obſerved, that when they hear the noiſe of the fall more loud than ordinary, they are ſure that a north-eaſt wind will follow; which is the more ſurpriſing, as the fort lies ſouth-weſt from the fall. At ſome times the fall makes a much greater noiſe than at others; and this is held for an infallible ſign of approaching rain or other bad weather.

From the place where the water falls there ariſes abundance of vapour like very thick ſmoke, inſomuch that when viewed at a diſtance you would think that the Indians had ſet the foreſts on fire. Theſe vapours riſe high in the air when it is calm, but are diſperſed by the wind when it blows hard. If you go into this vapour or fog, or if the wind blows it on you, it is ſo penetrating, that in a few moments you will be as wet as if you had been under water. Some are of opinion that when birds come flying into this fog or ſmoke of the fall, they drop down and periſh in the water; either becauſe their wings are become wet, or that the noiſe of the fall aſtoniſhes them, and they know not where to go in the darkneſs: but others think that ſeldom or never any bird periſhes there in that manner; becauſe among the abundance of birds found dead below the fall, there are no other ſorts than ſuch as live and ſwim frequently in the water; as ſwans, geeſe, ducks, water hens, teal, and the like. And very often great flocks of them are ſeen going to deſtruction in this manner: they ſwim in the river above the fall, and ſo are carried down lower and lower by the water; and as water fowl commonly take great delight in being carried with the ſtream, they indulge themſelves in enjoying this pleaſure ſo long, till the ſwiftneſs of the water becomes ſo great, that it is no longer poſſible for them to riſe, but they are driven down the precipice and periſh. They are obſerved, when they draw nigh the fall, to endeavour with all their might to take wing and leave the water; but they cannot. In the months of September and October ſuch abundant quantities of dead water fowl are found every morning below the fall, on the ſhore, that the garriſon of the fort for a long time live chiefly upon them. Beſides the fowl, they find alſo ſeveral ſorts of dead fiſh, alſo deer, bears, and other animals which have tried to croſs the water above the fall: the larger animals are generally found broken to pieces. Juſt below, a little way from the fall, the water is not rapid, but goes all in circles, and whirls like a boiling pot; which however does not hinder the Indians going upon it in ſmall canoes a-fiſhing; but a little further, and lower, the other ſmaller falls begin. When you are above the fall, and look down, your head begins to turn; even ſuch as have been here numberleſs times, will ſeldom venture to look down, without at the ſame time keeping faſt hold of ſome tree with one hand.

It was formerly thought impoſſible for any body living to come at the iſland that is in the middle of the fall: but an accident that happened about 50 years ago made it appear otherwiſe. The hiſtory is this: Two Indians of the Six Nations went out from Niagara fort to hunt upon an iſland that is in the middle of the river, or ſtrait, above the great fall, on which there uſed to be abundance of deer. They took ſome French brandy with them from the fort, which they taſted ſeveral times as they were going over the carrying place; and when they were in their canoe, they took now and then a dram, and ſo went along up the ſtrait towards the iſland where they propoſed to hunt; but growing ſleepy, they laid themſelves down in the canoe, which getting looſe drove back with the ſtream, farther and farther down, till it came nigh that iſland that is in the middle of the fall. Here one of them, awakened by the noiſe of the fall, cries out to the other that they were gone: Yet they tried if poſſible to ſave life. This iſland was nigheſt, and with much working they got on ſhore there. At firſt they were glad; but when they had conſidered every thing, they thought themſelves hardly in a better ſtate than if they had gone down the fall, ſince they had now no other choice, than either to throw themſelves down the ſame, or periſh with hunger. But hard neceſſity put them on invention. At the lower end of the iſland the rock is perpendicular, and no water is running there. The iſland has plenty of wood; they went to work then, and made a ladder or ſhrouds of the bark of the lind tree (which is very tough and ſtrong) ſo long till they could with it reach the water below; one end of this bark ladder they tied faſt to a great tree that grew at the ſide of the rock above the fall, and let the other end down to the water. So they went down along their new invented ſtairs, and when they came to the bottom in the middle of the fall they reſted a little; and as the water next below the fall is not rapid, as before mentioned, they threw themſelves out into it, thinking to ſwim on ſhore. We have ſaid before, that one part of the fall is on one ſide of the iſland, the other on the other ſide. Hence it is, that the waters of the two cataracts running againſt each other, turn back againſt the rock that is juſt under the iſland. Therefore, hardly had the Indians begun to ſwim, before the waves of the eddy threw them back with violence againſt the rock from whence they came. They tried it ſeveral times, but at laſt grew weary; and by being often thrown againſt the rock they were much bruiſed, and the ſkin torn off their bodies in many places. So they were obliged to climb up ſtairs again to the iſland, not knowing what to do. After ſome time they perceived Indians on the ſhore, to whom they cried out. Theſe ſaw and pitied them, but gave them little hope or help: yet they made haſte down to the fort, and told the commandant where two of their brothers were. He perſuaded them to try all poſſible means of relieving the two poor Indians; and it was done in the following manner:

The water that runs on the eaſt ſide of this iſland is ſhallow, eſpecially a little above the iſland towards the eaſtern ſhore. The commandant cauſed poles to be made and pointed with iron; two Indians took upon them to walk to this iſland by the help of theſe poles, to ſave the other poor creatures, or periſh themſelves. They took leave of all their friends, as if they were going to death. Each had two ſuch poles in his hands, to ſet to the bottom of the ſtream, to keep them ſteady; and in this manner reached the iſland: and having given poles to the two poor Indians there, they all returned ſafely to the main land. Theſe two Indians (who in the abovementioned manner were firſt brought to this iſland) were nine days on the iſland, and almoſt ready to ſtarve to death. Now ſince the road to this iſland has been found, the Indians go there often to kill deer, which have tried to croſs the river above the fall, and are driven upon it by the ſtream. On the weſt ſide of this iſland are ſome ſmall iſlands or rocks, of no conſequence. The eaſt ſide of the river is almoſt perpendicular, the weſt ſide more ſloping. In former times, a part of the rock at the fall which is on the weſt ſide of the iſland, hung over in ſuch a manner, that the water which fell perpendicularly from it left a vacancy below, ſo that people could go under between the rock and the water; but the prominent part ſome years ſince broke off and fell down. The breadth of the fall, as it runs in a ſemicircle, is reckoned to be about 300 feet. The iſland is in the middle of the fall, and from it the water on each ſide is almoſt the ſame breadth; the breadth of the iſland at its lower end is about 100 feet. Below the fall, in the holes of the rocks, are great plenty of eels, which the Indians and French catch with their hands without any other means. Every day when the ſun ſhines, you ſee here from ten o'clock in the morning to two in the afternoon, below the fall, and under you, where you ſtand at the ſide of the fall, a glorious rainbow, and ſometimes two, one within the other. The more vapours, the brighter and clearer is the rainbow. When the wind carries the vapours from that place, the rainbow is gone, but appears again as ſoon as new vapours come. From the fall to the landing above it, where the canoes from Lake Erie put aſhore (or from the fall to the upper end of the carrying place), is half a mile. Lower the canoes dare not come, leſt they ſhould be obliged to try the fate of the two Indians, and perhaps with leſs ſucceſs. They have often found below the fall pieces of human bodies, perhaps drunken Indians, that have unhappily come down to the fall. The French ſay, that they have often thrown whole great trees into the water above, to ſee them tumble down the fall: they went down with ſurpriſing ſwiftneſs, but could never be ſeen afterwards; whence it was thought there was a bottomleſs deep or abyſs juſt under the fall. The rock of the fall conſiſts of a gray limeſtone.

Having mentioned the *Six Nations* which live on the banks of the Niagara, we ſhall here, in addition to what we have ſaid elſewhere (ſee AMERICA, N° 17.) ſubjoin a few particulars relative to thoſe nations which, as they ſeem not to be well underſtood even in America, are probably ſtill leſs known in Europe. The information which we have to give was communicated to the Royal Society of London by Mr Richard M'Cauſland ſurgeon to the 8th regiment of foot, who, writing from the beſt authority, informs us, that each nation is divided into three tribes, of which the principal are called the *turtle tribe*, the *wolf tribe*, and the *bear tribe*.

Each tribe has two, three, or more chiefs, called *ſachems*; and this diſtinction is always hereditary in the family, but deſcends along the female line: for inſtance, if a chief dies, one of his ſiſter's ſons, or one of his own brothers, will be appointed to ſucceed him. Among theſe no preference is given to proximity or primogeniture; but the ſachem, during his lifetime, pitches upon one whom he ſuppoſes to have more abilities than the reſt; and in this choice he frequently, though not always, conſults the principal men of the tribe. If the ſucceſſor happens to be a child, the offices of the poſt are performed by ſome of his friends until he is of ſufficient age to act himſelf.

Each of theſe poſts of ſachem has a name which is peculiar to it, and which never changes, as it is always adopted by the ſucceſſor: nor does the order of precedency of each of theſe names or titles ever vary. Nevertheleſs, any ſachem, by abilities and activity, may acquire greater power and influence in the nation than thoſe who rank before him in point of precedency; but this is merely temporary, and dies with him.

Each tribe has one or two chief warriors; which dignity is alſo hereditary, and has a peculiar name attached to it.

Theſe are the only titles of diſtinction which are fixed and permanent in the nation; for although any Indian may by ſuperior talents, either as a counſellor or as a warrior, acquire influence in the nation, yet it is not in his power to tranſmit this to his family.

The Indians have alſo their great women as well as their great men, to whoſe opinions they pay great deference; and this diſtinction is alſo hereditary in families. They do not ſit in council with the ſachems, but have ſeparate ones of their own.—When war is declared, the ſachems and great women generally give up the management of public affairs into the hands of the warriors. It may however ſo happen, that a ſachem may at the ſame time be alſo a chief warrior.

Friendſhips ſeem to have been inſtituted with a view towards ſtrengthening the union between the ſeveral nations of the confederacy; and hence friends are called the *ſinews of the Six Nations*. An Indian has therefore generally one or more friends in each nation. Beſides the attachment which ſubſiſts during the lifetime of the two friends, whenever one of them happens to be killed, it is incumbent on the ſurvivor to replace him, by preſenting to his family either a ſcalp, a priſoner, or a belt conſiſting of ſome thouſands of wampum; and this ceremony is performed by every friend of the deceaſed.

The purpoſe and foundation of war parties, therefore, is in general to procure a priſoner or ſcalp to replace the friend or relation of the Indian who is the head of the party. An Indian who wiſhes to replace a friend or relation preſents a belt to his acquaintance; and as many as chooſe to follow him accept this belt, and become his party. After this, it is of no conſequence whether he goes on the expedition or remains at home (as it often happens that he is a child;) he is ſtill conſidered as the head of the party. The belt he preſented to his party is returned fixed to the ſcalp or priſoner, and paſſes along with them to the friends of the perſon he replaces. Hence it happens, that a war party, returning with more ſcalps or priſoners than the original intention of the party required, will often give one of theſe ſupernumerary ſcalps or priſoners to another war party [illegible] meet going out; upon which this party, having fulfilled the purpoſe of their expedition, will ſometimes return without going to war.

NICÆA, (anc. geog.), the metropolis of Bithynia; ſituated on the lake Aſcanius, in a large and fertile plain; in compaſs 16 ſtadia: firſt built by Antigonus, the ſon of Philip, and thence called *Antigonea*; afterwards completed by Lyſimachus, who called it *Nicæa*, after his conſort the daughter of Antipater. According to Stephanus, it was originally a colony of the Bottiæi, a people of Thrace, and called *Ancore*; and afterwards called *Nicæa*. Now *Nice* in Aſia the Leſs*. Famous for the firſt general council.—A ſecond *Nicæa*, (Diodorus Siculus), of Corſica.—A third, of the Hither India, (Arrian); ſituted on the weſt ſide of the Hydaſpes, oppoſite to Buciphale, on the eaſt ſide.—A fourth *Nicæa*, a town of Liguria, at the Maritime Alps, on the eaſt ſide of the river Paulon near its mouth, which runs between the Varus and Nicæa, (Mela). A colony of the Maſſilians, (Stephanus); the laſt town of Italy to the weſt. Now *Nizza* or *Nice*, capital of the county of that name, on the Mediterranean.—A fifth, of Locris, (Strabo); a town near Thermopylæ; one of the keys of that paſs. It ſtood on the Sinus Maliacus.

NICAISE (Claude), a celebrated antiquary in the 17th century, was deſcended of a good family at Dijon, where his brother was proctor-general of the chamber of accounts. Being inclined to the church, he became an eccleſiaſtic, and was made a canon in the holy chapel at Dijon; but devoted himſelf wholly to the ſtudy and knowledge of antique monuments. Having laid a proper foundation of learning at home, he reſigned his canonry, and went to Rome, where he reſided many years; and after his return to France, he held a correſpondence with almoſt all the learned men in Europe. Perhaps there never was a man of letters who had ſo frequent and extenſive a commerce with the learned men of his time as the Abbé Nicaiſe. This correſpondence took up a great part of his time, and hindered him from enriching the public with any large works; but the letters which he wrote himſelf, and thoſe which he received from others, would made a fine and curious *Commercium Epiſtolicum*. He publiſhed a Latin diſſertation *De Nummo Pantheo*; An Explication of an Antique Monument found at Guienne, in the dioceſe of Aach; and A Diſcourſe upon the Form and Figure of the Syrens, which made a great noiſe. In this tract, following the opinion of Huet biſhop of Avranches, he undertook to prove, that they were in reality birds, and not fiſhes or ſea monſters. He tranſlated into French, from the Italian, a piece of Bellori, containing a deſcription of the pictures in the Vatican, to which he added, A Diſſertation upon the Schools of Athens and Parnaſſus, two of Raphael's pictures. He wrote alſo a ſmall tract upon the ancient muſic; and died while he was labouring to preſent the public with the explanation of that antique inſcription, *Minervæ Arpatiæ*, which was found in the village of Velley, where he died in October 1701, aged 78.

NICANDER of Colophon, a celebrated grammarian, poet, and phyſician, who lived about the 160th Olympiad, 140 years before Chriſt, in the reign of Attalus king of Pergamus, who overcame the Gallo-Greeks. He lived many years in Etolia, of which country he wrote a hiſtory. He wrote alſo many other works, of which only two are now remaining. The one is entitled *Theriaca*, deſcribing in verſe the accidents attending wounds made by venomous beaſts, with the proper remedies; the other bearing the title of *Alexipharmaca*, wherein he treats poetically of poiſons and their antidotes. This Nicander is not to be confounded with Nicander of Thyatira.

NICANDRA, in botany: A genus of the monogynia order, belonging to the decandria claſs of plants: and in the natural method ranking under the 30th order, *Contortæ*. The calyx is monophyllous and quadripartite: the corolla is monopetalous, tubulated, and parted into 10 *laciniæ*: the fruit is an oval berry, which is grooved longitudinally, and contains many ſmall angular ſeeds. Of this there is only one ſpecies, the *amara*, a native of Guiana. The leaves and ſtalks are bitter, and uſed by the natives as an emetic and purge.

NICARAGUA, a large river of South America, in a province of the ſame name, whoſe weſtern extremity lies within five miles of the South ſea. It is full of dreadful cataracts, and falls at length into the North ſea.

Nicaragua, a maritime province of South America, in Mexico, bounded on the north by Honduras, on the eaſt by the North ſea, on the ſouth-eaſt by Coſta Rica, and on the ſouth-weſt by the South ſea; being 400 miles in length from eaſt to weſt, and 120 in breadth from north to ſouth. It is one of the moſt fruitful and agreeable provinces in Mexico, and is well watered with lakes and rivers. The air is wholeſome and temperate; and the country produces plenty of ſugar, cochineal, and fine chocolate. One of the lakes is 200 miles in circumference, has an iſland in the middle, and, as ſome ſay, has a tide. Leon de Nicaragua is the capital town.

NICARIA, an iſland of the Archipelago, between Samos and Tine, about 50 miles in circumference. A chain of high mountains runs through the middle, covered with wood, and ſupplies the country with ſprings. The inhabitants are very poor, and of the Greek communion; however, they have a little wheat, and a good deal of barley, figs, honey, and wax.

NICASTRO, an epiſcopal town of Italy, in the kingdom of Naples, and in the Farther Calabria; 16 miles ſouth of Coſenza. E. Long. 15. 59. N. Lat. 39. 15.

NICE, an ancient, handſome, and conſiderable town on the confines of France and Italy, and capital of a county of the ſame name, with a ſtrong citadel, a biſhop's ſee, and a ſenate, which is a kind of a democracy. It has been ſeveral times taken by the French, and laſt of all in 1744, but reſtored after the treaty of Aix-la-Chapelle. It is very agreeably ſituated, four miles from the mouth of the river Var, 83 miles S. by W. of Turin, and 83 eaſt of Aix. E. Long. 6. 22. N. Lat. 43. 42.

Nice, a county and province in the dominions of the duke of Savoy. The inhabitants ſupply Genoa with a great deal of timber for building ſhips; and carry on a great trade in linen cloth, paper, oil, wine, and honey.—"Although the county of Nice be on this

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* See *Nice*.

Hiſtorical and Pictureſque deſcription of the County of Nice.

this ſide of the mountains, geographers have always conſidered it as a province of Italy, ſince they have given to this beautiful part of Italy the river Var for a weſtern limit, which is alſo the boundary of the county, and flows into the ſea at a league diſtance from the capital. This province is partly covered by the maritime Alps; and is bordered on the eaſt by Piedmont, and the ſtates of Genoa; on the ſouth by the Mediterranean; on the weſt by the Var; and on the north by Dauphiny. Its length is about 20 leagues of the country, which make about 36 Engliſh miles; its breadth is 10 leagues; and its population is about 120,000 ſouls.

"The city of Nice is the capital, and the ſeat of the ſenate, the biſhopric, and government. It has become, within theſe few years, a delightful abode, by the number of ſtrangers who aſſemble there in the winter, either to re-eſtabliſh their health, or to enjoy the mildneſs of the climate, and the beauty of the country, where an unceaſing verdure preſents eternal ſpring.

"The town is ſituated on the ſea-ſhore, and is backed by a rock entirely inſulated, on which was formerly a caſtle, much eſteemed for its poſition; but it was deſtroyed in the year 1706 by Marechal Berwick, the garriſon being too thin to defend the extent of the works. There is a diſtinction between the old and the new town; this laſt is regular, the houſes are well built, and the ſtreets are wide. Its poſition is by the ſide of the ſea, and it is terminated, on one ſide, by a charming terrace, which ſerves for a promenade.

"Any perſon may live peaceably in this province, without fear of being troubled on points of faith, provided he conducts himſelf with decorum. The town has three ſuburbs. 1ſt, That of St John, which conducts to Cimier, about three leagues north from Nice, &c. The promenades this way are very delightful, and may be enjoyed in a carriage. 2d, That of the Poudriere. 3d, That of the *Croix de Marbre*, or Marble Croſs. This ſuburb is new; and the Engliſh almoſt all lodge in it, being very near the town. The houſes are commodious, facing on one ſide the great road which leads to France, and on the other a fine garden, with a proſpect of the ſea. All the houſes are ſeparate from each other: the company hire them for the ſeaſon, *i. e.* from October till May. Apartments may be had from 15 to 250 louis. The proprietors commonly furniſh linen, plate, &c. There are alſo in the town very large and commodious houſes; as well as the new road, which is opened from the town to the port, by cutting that part of the rock which inclined toward the ſea. The ſituation is delightful, and warmeſt in winter, being entirely covered from the north wind, and quite open to the ſouth.

"The company is brilliant at Nice, and the amuſements of the Carnival are, in proportion to the ſize of the town, as lively as in any of the great ones in France. There is always an Italian opera, a concert and maſked ball, alternately; and the company play rather high.

"It is impoſſible to find a happier climate than Nice, both for ſummer and winter. Reaumur's thermometer, in 1781, never fell more than three degrees below the freezing point, and that only for two days; while at Geneva it fell ten: and in the courſe of the winter of 1785 it fell only two degrees; while at Geneva it fell 15. The month of May is rarely ſo fine in France as February at Nice. The ſummer is not ſo hot as might be expected. The thermometer never riſes more than 24 degrees above temperate in the ſhade; and there is always an agreeable ſea breeze from ten in the morning till ſunſet, when the land breeze comes on. There are three chains of graduated mountains, the laſt of which confound their ſummits with the Alps; and to this triple rampart is owing the mild temperature ſo ſenſibly different from that of the neighbouring parts.

"The cultivation of the ground is as rich as can be deſired. There are alternately rows of corn and beans, ſeparated by vines attached to different fruit-trees, the almond and the fig; ſo that the earth being inceſſantly cultivated, and covered with trees, olive, orange, cedar, pomegranate, laurel, and myrtle, cauſes the conſtant appearance of ſpring, and forms a fine contraſt with the ſummits of the Alps, in the back ground, covered with ſnow."

Nice, an ancient town of Aſia, in Natolia, now called *Iſnic*, with a Greek archbiſhop's ſee. It is famous for the general council aſſembled here in 325, which endeavoured to ſuppreſs the doctrines of Arius. It was formerly a large, populous, and well built place, and even now is not inconſiderable. See Isnic.

Nicene Creed, was compoſed and eſtabliſhed, as a proper ſummary of the Chriſtian faith, by the council at Nice in 325, againſt the Arians.—It is alſo called the *Conſtantinopolitan creed*, becauſe it was confirmed, with ſome few alterations, by the council of Conſtantinople in 381. See Creed.

NICEPHORUS (Gregoras), a Greek hiſtorian, was born about the cloſe of the 13th century, and flouriſhed in the 14th, under the emperors Andronicus, John Palæologus, and John Cantacuzenus. He was a great favourite of the elder Andronicus, who made him librarian of the church of Conſtantinople, and ſent him ambaſſador to the prince of Servia. He accompanied this emperor in his misfortunes, and aſſiſted at his death; after which he repaired to the court of the younger Andronicus, where he ſeems to have been well received; and it is certain that, by his influence over the Greeks, that church was prevailed on to refuſe entering into any conference with the legates of Pope John XXII. But in the diſpute which aroſe between Barlaam and Palamos, taking the part of the former, he maintained it zealouſly in the council that was held at Conſtantinople in 1351; for which he was caſt into priſon, and continued there till the return of John Palæologus, who releaſed him; after which he held a diſputation with Palamos, in the preſence of that emperor. He compiled a hiſtory, which in 11 books contains all that paſſed from 1204, when Conſtantinople was taken by the French, to the death of Andronicus Palæologus the younger, in 1341.—The beſt edition of this work is that of the Louvre, in Greek and Latin, in 1702.

Nicephorus (Caliſtus), a Greek hiſtorian, who flouriſhed in the 14th century under the emperor Andronicus Palæologus the elder, wrote an eccleſiaſtical hiſtory in 23 books; 18 of which are ſtill extant, containing the tranſactions of the church from the birth of

Chriſt to the death of the emperor Phocas in 610.—We have nothing elſe but the arguments of the other five books, from the commencement of the reign of the emperor Heraclius, to the end of that of Leo the philoſopher, who died in the year 911. Nicephorus dedicated his hiſtory to Andronicus Palæologus the elder. It was tranſlated into Latin by John Langius; and has gone through ſeveral editions, the beſt of which is that of Paris, in 1630.

Nicephorus (Blemmidas), a prieſt and monk of Mount Athos, flouriſhed in the 13th century. He refuſed the patriarchate of Conſtantinople, being favourable to the Latin church, and more inclined to peace than any of the Greeks of his time. In this ſpirit he compoſed two treatiſes concerning *The Proceſſion of the Holy Ghoſt*: one addreſſed to James patriarch of Bulgaria, and the other to the emperor Theodore Laſcaris. In both theſe he refutes thoſe who maintain, that one cannot ſay the Holy Ghoſt proceeds from the Father and the Son. Theſe two tracts are printed in Greek and Latin by Allatius, who has alſo given us a letter written by Blemmidas on his expelling from the church of her convent Marcheſinos, miſtreſs of the emperor John Ducas. There are ſeveral other pieces of our author in the Vatican library.

NICERON (John Francis), was born at Paris in 1613. Having finiſhed his academical ſtudies, with a ſucceſs which raiſed the greateſt hopes of him, he entered into the order of the Minims, and took the habit in 1632; whereupon, as is uſual, he changed the name given him at his baptiſm for that of Francis, the name of his paternal uncle, who was alſo a Minim, or Franciſcan. The inclination and taſte which he had for mathematics appeared early. He began to apply himſelf to that ſcience in his philoſophical ſtudies, and devoted thereto all the time he could ſpare from his other employments, after he had completed his ſtudies in theology. All the branches of the mathematics, however, did not equally engage his attention; he confined himſelf particularly to optics, and only learned of the reſt as much as was neceſſary for rendering him perfect in this. There remain ſtill, in ſeveral houſes wherein he dwelt, eſpecially at Paris, ſome excellent performances, which diſcover his ſkill in this way, and which make us regret that a longer life did not ſuffer him to carry it to that perfection which he deſired; ſince one cannot help being ſurpriſed that he proceeded ſo far as he did, in the midſt of thoſe occupations and travels by which he was forced from it, during the ſhort ſpace of time which he lived. He hath himſelf obſerved, in the preface to his *Thaumaturgus Opticus*, that he went twice to Rome; and that, on his return home, he was appointed teacher of theology. He was afterwards choſen to accompany Father Francis de la Noue, vicar general of the order, in his viſitation of the convents throughout all France. But the eagerneſs of his paſſion for ſtudy put him upon making the beſt of all the moments he had to ſpare for books; and that wiſe economy furniſhed him with as much as ſatisfied him. Being taken ſick at Aix in Provence, he died there Sept. 22. 1646, aged 33. He was an intimate acquaintance of Des Cartes. A liſt of his writings is inſerted below (A).

Niceron (John Peter), ſo much celebrated on account of his *Memoirs of Men illuſtrious in the Republic of Letters*, was born at Paris, March 11. 1685. He was of an ancient and noble family, who were in very high repute about 1540. He ſtudied with ſucceſs in the Mazarine college at Paris, and afterwards at the college Du Pleſſis. In a ſhort time, reſolving to forſake the world, he conſulted one of his uncles, who belonged to the order of Bernabite Jeſuits. This uncle examined him; and, not diffident of his election, introduced him as a probationer to that ſociety at Paris.—He was received there in 1702, took the habit in 1703, and made his vows in 1704, at the age of 19.

After he had profeſſed himſelf, he was ſent to Montarges, to go through a courſe of philoſophy and theology; thence he went to Loches in Touraine to teach thoſe ſciences. He received the prieſthood at Poitiers in 1708. As he was not arrived at the age to aſſume this order, a diſpenſation, which his uncommon piety had merited, was obtained in his favour. The college of Montarges having recalled him, he was their profeſſor of rhetoric two years, and of philoſophy four.—In ſpite of all theſe avocations, he was humanely attentive to every call and work of charity, and to the inſtruction of his fellow creatures, many of whom heard him deliver out fit rules of conduct for them, not only from the pulpits of moſt of the churches within the province, but even from thoſe of Paris.—In 1716, his ſuperiors invited him to that city, that he might have an opportunity of following, with the more convenience, thoſe ſtudies for which he always had expreſſed the greateſt inclination. He not only underſtood the ancient but the modern languages; a circumſtance of infinite advantage in the compoſition of thoſe works which he has given to the public, and which he carried on with great aſſiduity to the time of his death, which happened, after a ſhort illneſs, July 8. 1738, at the age of 53. His works are, 1. *Le grand Febrifuge*; or, a Diſſertation to prove that common water is the beſt remedy in fevers, and even in the plague, tranſlated from the Engliſh of John Hancock miniſter of St Margaret's, London; in 12mo. This little treatiſe made its appearance, amongſt other pieces relating to this ſubject, in 1720; and was attended with a ſucceſs which carried it through three editions; the laſt came out in 1730, in 2 vols. 12mo, entitled, *A Treatiſe on Common Water*; Paris, printed by Cavelier. 2. *The Voyages of John Ovington to Surat, and divers parts of Aſia and Africa*, containing the hiſtory of the revolution in the kingdom of Golconda, and ſome obſervations upon ſilk worms; Paris, 1725, 2 vols. 12mo. 3. *The Converſion of England to Chriſtianity, compared with its pretended Reformation*, a work tranſlated from

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(A) Theſe are, 1. *L'Interpretation des chiffres, ou regles pour bien entendre et expliquer facilement toutes ſortes des chiffres ſimples*, &c. 2. *La perſpective curieuſe, ou magie artificielle des effets merveilleux de l'optique, catoprique, et dioptrique.* This is only an eſſay to the following work: 3. *Thaumaturgus opticus; ſive, Admiranda optices, catoptrices, et dioptrices, pars prima*, &c. He intended to add two other parts, but was prevented by death.

the Engliſh; Paris 1729, 8vo. 4. *The Natural Hiſtory of the Earth*, tranſlated from the Engliſh of Mr Woodward, by Monſ. Nogues, doctor in phyſic; with an anſwer to the objections of Dr Carmerarius; containing alſo ſeveral letters written on the ſame ſubject, and a methodical diſtribution of foſſils, tranſlated from the Engliſh by Niceron; Paris 1735, 4to. 5. *Memoirs of Men illuſtrious in the Republic of Letters*, with a critical account of their works; Paris, 12mo. The firſt volume of this great work appeared in 1727; the others were given to the public in ſucceſſion, as far as the 39th, which appeared in 1738. The 40th volume was publiſhed after the death of the author, in 1739.

NICETAS (David), a Greek hiſtorian, a native, as ſome relate, of Paphlagonia, who lived about the end of the 9th century. He wrote *The Life of St Ignatius*, patriarch of Conſtantinople, which was tranſlated into Latin by Frederic Mutius, biſhop of Termoli: he compoſed alſo ſeveral panegyrics in honour of the apoſtles and other ſaints, which are inſerted in the laſt continuation of the *Bibliotheca Patrum* by Combeſis.

Nicetas (ſurnamed Serron), deacon of the church of Conſtantinople, cotemporary with Theophylact in the 11th century, and afterwards biſhop of Heraclea, wrote a *Catena upon the book of Job*, compiled from paſſages of ſeveral of the fathers, which was printed at London in folio, 1637. We have alſo, by the ſame writer, ſeveral *catenæ* upon the Pſalms and Canticles, Baſil 1552; together with a Commentary on the poems of Gregory Nazianzen.

Nicetas (Arhominates), a Greek hiſtorian of the 13th century, called *Coniates*, as being born at Chone, or Coloſſus, in Phrygia. He was employed in ſeveral conſiderable affairs at the court of Conſtantinople; and when that city was taken by the French in 1204, he withdrew, with a young girl taken from the enemy, to Nice in Bithynia, where he married his captive, and died in 1206. He wrote a Hiſtory, or Annals, from the death of Alexius Comnenus in the year 1118, to that of Badouin in 1205; of which work we have a Latin tranſlation by Jerome Wolfius, printed at Baſil in 1557; and it has been inſerted in the body of the Byzantine Hiſtorians, printed in France at the Louvre.

NICHE, in architecture, a hollow ſunk into a wall, for the commodious and agreeable placing of a ſtatue. The word comes from the Italian *nechia*, "ſea-ſhell;" in regard the ſtatue is here encloſed in a ſhell, or perhaps on account of the ſhell wherewith the tops of ſome of them are adorned.

NICHOLS (William), ſon of John Nichols of Donington, in Bucks, was born in 1664. At what ſchool he was educated we have not been informed; but in 1679 he became a commoner of Magdalene Hall, Oxford, whence he afterwards removed to Wadham College, and took the degree of bachelor of arts, Nov. 27. 1683.—In October 1684, he was admitted probationer fellow of Merton College. At the commencement of 1688, he took his maſter's degree; and about the ſame time being admitted into orders, he became chaplain to Ralph earl of Montague, and was in September 1791 preferred to the rectory of Selſey; near Chicheſter, in Suſſex. He was admitted B. D. July 2. 1692; and D. D. Nov. 29. 1695. Though his time was wholly devoted to piety and ſtudy, and though he publiſhed, in Latin and in Engliſh, no fewer than 19 works in defence of Chriſtianity, and the doctrines and worſhip of the church of England, he was ſo totally overlooked, even by thoſe who profeſſed to be patrons of orthodoxy, that towards the cloſe of his life we find him complaining to Robert earl of Oxford, that he was forced on the drudgery of being editor of Mr Selden's books for a little money to buy other books, to enable him to carry on his liturgical labours. He died in the beginning of the year 1712. Of his numerous publications, thoſe which are moſt generally known are, *A Conference with a Theiſt*, in five parts, and *A Comment on the Book of Common Prayer and Adminiſtration of the Sacraments*, &c. A volume of letters in Latin between him and Joblonſki, Oſtervald, and Wetſtein, &c. was preſented, October 28. 1712, by his widow to the archbiſhop of Canterbury; and they are now preſerved among the valuable MSS. at Lambeth, N° 676.

NICHOLLS (Dr Frank), was born in London in the year 1699. His father was a barriſter at law; and both his parents were of good families in Cornwall. After receiving the firſt rudiments of his education at a private ſchool in the country, where his docility and ſweetneſs of temper endeared him equally to his maſter and his ſchool fellows, Frank was in a few years removed to Weſtminſter, and from thence to Oxford, where he was admitted a commoner (or ſojourner) of Exeter college, under the tuition of Mr John Haviland, on March 4. 1714. There he applied himſelf diligently to all the uſual academical ſtudies, but particularly to natural philoſophy and polite literature, of which the fruits were moſt conſpicuous in his ſubſequent lectures on phyſiology. After reading a few books on anatomy, in order to perfect himſelf in the nomenclature of the animal parts then adopted, he engaged in diſſections, and then devoted himſelf to the ſtudy of nature, perfectly free and unbiaſſed by the opinions of others.

On his being choſen reader of anatomy in that univerſity, he employed his utmoſt attention to elevate and illuſtrate a ſcience which had there been long depreſſed and neglected; and by quitting the beaten track of former lecturers, and minutely inveſtigating the texture of every bowel, the nature and order of every veſſel, &c. he gained a high and a juſt reputation. He did not then reſide at Oxford; but, when he had finiſhed his lectures, uſed to repair to London, the place of his abode, where he had determined to ſettle. He had once an intention of fixing in Cornwall, and for a ſhort time practiſed there with great reputation; but being ſoon tired of the fatigues attendant on that profeſſion in the country, he returned to London, bringing back with him a great inſight, acquired by diligent obſervation, into the nature of the miliary fever, which was attended with the moſt ſalutary effects in his ſubſequent practice at London.

About this time he reſolved to viſit the continent, partly with a view of acquiring the knowledge of men, manners, and languages; but chiefly to acquaint himſelf with the opinions of foreign naturaliſts on his favourite ſtudy. At Paris, by converſing freely with the learned, he ſoon recommended himſelf to their notice and eſteem. Winſlow's was the only good ſyſtem of phyſiology at that time known in France, and Morgagni's and Santorini's of Venice in Italy, which Dr Nicholls likewiſe ſoon after viſited. On his return to England, he repeated his phyſiological lectures in London, which were much frequented, not only by ſtudents from both the univerſities, but alſo by many ſurgeons, apothecaries, and others. Soon after, his new and ſucceſsful treatment of the miliary fever, then very prevalent in the ſouthern parts of England, added much to his reputation. In 1725, at a meeting of the Royal Society, he gave his opinion on the nature of *aneuriſms*, in which he diſſented from Dr Freind in his Hiſtory of Phyſic.

At the beginning of the year 1728, he was choſen a fellow of the Royal Society, to which he afterwards communicated the deſcription of an uncommon diſorder (publiſhed in the Tranſactions), viz. a polypus, reſembling a branch of the pulmonary vein (for which Tulpius has ſtrangely miſtaken it), coughed up by an aſthmatic perſon. He alſo made obſervations (in the ſame volume of the Tranſactions) on a treatiſe, by M. Helvetius of Paris, on the Lungs. Towards the end of the year 1729, he took the degree of doctor of phyſic at Oxford. At his return to London, he underwent an examination by the preſident and cenſors of the College of Phyſicians, previous to his being admitted a candidate, which every practitioner muſt be a year before he can apply to be choſen a fellow. Dr. Nicholls was choſen into the college on June 26. 1732; and two years after, being choſen Gulſtonian reader of Pathology, he made the ſtructure of the heart, and the circulation of the blood, the ſubject of his lectures. In 1736, at the requeſt of the preſident, he again read the Gulſtonian lecture; taking for his ſubject thoſe parts of the human body which ſerve for the ſecretion and diſcharge of the urine; and the cauſes, ſymptoms, and cure, of the diſeaſes occaſioned by the ſtone. In 1739, he delivered the anniverſary Harveian oration. In 1743, he married Elizabeth, youngeſt daughter of the celebrated Dr Mead, by whom he had five children, two of whom died young. Two ſons and a daughter ſurvived him. In 1748, Dr Nicholls undertook the office of chirurgical lecturer, beginning with a learned and elegant diſſertation on the *Anima Medica*. About this time, on the death of Dr John Cuningham, one of the elects of the college, Dr Abraham Hall was choſen to ſucceed him, in preference to our author, who was his ſenior, without any apparent reaſon. With a juſt reſentment, he immediately reſigned the office of chirurgical lecturer, and never after attended the meetings of the fellows, except when buſineſs of the utmoſt importance was in agitation.

In 1751, he took ſome revenge in an anonymous pamphlet, entitled "The petition of the Unborn Babes to the Cenſors of the Royal College of Phyſicians of London;" in which Dr Neſbit (*Pocus*), Dr Maule (*Maulus*), Dr Barrowby (*Barebone*), principally, and Sir William Brown, Sir Edward Hulſe, and the Scots incidentally, are the objects of his ſatire.

In 1753, on the death of Sir Hans Sloane, Bart in his 94th year, Dr Nicholls was appointed to ſucceed him as one of the king's phyſicians, and held that office till the death of his royal maſter in 1760, when this moſt ſkilful phyſician was ſuperſeded with ſomething like the offer of a penſion, which he rejected with diſdain.

The cauſes, &c. of the uncommon diſorder of which the late king died, viz. a rupture of the right ventricle of the heart, our author explained in a letter to the earl of Macclesfield, preſident of the Royal Society, which was publiſhed in the Philoſophical Tranſactions Vol. L.

In 1772, to a ſecond edition of his treatiſe *De Anima Medica*, he added a diſſertation *De motu cordis et ſanguinis in homine nato et non nato*, inſcribed to his learned friend and coadjutor the late Dr Lawrence.

Tired at length of London, and alſo deſirous of ſuperintending the education of his ſon, he removed to Oxford, where he had ſpent moſt agreeably ſome years in his youth. But when the ſtudy of the law recalled Mr Nicholls to London, he took a houſe at Epſom, where he paſſed the remainder of his life in a literary retirement, not inattentive to natural philoſophy, eſpecially the cultivation of grain, and the improvement of barren ſoils, and contemplating alſo with admiration the internal nature of plants, as taught by Linnæus.

His conſtitution never was robuſt. In his youth, at Oxford, he was with difficulty recovered from a dangerous fever by the ſkill of Doctors Frampton and Frewen; and afterwards at London he had frequently been afflicted with a catarrh, and an inveterate aſthmatic cough, which, returning with great violence at the beginning of the year 1778, deprived the world of this valuable man on January 7th, in the 80th year of his age.

Dr Lawrence, formerly preſident of the college of phyſicians, who gratefully aſcribed all his phyſiological and medical knowledge to his precepts, and who, while he lived, loved him as a brother, and revered him as a parent, two years after printed, and gave to his friends, a few copies of an elegant Latin Life of Dr Nicholls (with his head prefixed, a ſtriking likeneſs, engraved by Hall from a model of Goſſet, 1779); from which, through the medium of the Gentleman's Magazine, the above particulars are chiefly extracted.

NICIAS, a celebrated painter of Athens, flouriſhed about 322 years before the Chriſtian era; and was univerſally extolled for the great variety and noble choice of his ſubjects, the force and relievo of his figures, his ſkill in the diſtribution of the lights and ſhadows, and his dexterity in repreſenting all ſorts of four-footed animals, beyond any maſter of his time. His moſt celebrated piece was that of Tartarus or Hell, as it is deſcribed by Homer, for which King Ptolemy the ſon of Lagus offered him 60 talents, or 11,250l. which he refuſed, and generouſly preſented it to his own country. He was much eſteemed likewiſe by all his cotemporaries for his excellent talent in ſculpture.

NICKEL, in chemiſtry and mineralogy, a ſubſtance claſſed among the ſemimetals, though ſeveral eminent chemiſts are of opinion that it is a compound; and Mr Bergman, who has made more experiments upon it than any other perſon, conjectures that it is a modification of iron.

It was firſt obtained from an ore called *kupfer-nickel*, ſometimes gray coloured, but often of a reddiſh-yellow; though ſeveral others are now diſcovered. "It had its name (ſays Mr Bergman), and probably ſtill retains it, from this circumſtance, that though it has the appearance of containing copper, not the ſmalleſt particle of that metal can be extracted from it, even by fire." It was firſt mentioned by V. Hiema, in 1694, in a book written in the Swediſh language, concerning the diſcovery of ores and other mineral ſubſtances. It is ſuppoſed by Henckel to be a ſpecies of cobalt, or arſenic alloyed with copper. Cramer claſſes it with the arſenical or cupreous ores; though both they, and all other chemiſts, confeſs that they were never able to extract one particle of copper from it. Mr Cronſtedt, in the years 1751 and 1754, ſhowed by many accurate experiments that it contained a new ſemimetal, or at leaſt that a regulus different from all others was obtainable from its ore. This ore, called *kupfer-nickel*, or falſe copper, as has already been obſerved, is of a coppery lead colour, and almoſt always covered with a greeniſh gray efflореſcence. "It is (ſays Mr Fourcroy) *very common* at Freyberg in Saxony, where it is often mixed with the gray ore of cobalt; but it is diſtinguiſhed from it by its red colour." Mr Bergman, however, complains greatly of the *ſcarcity* of this mineral, ſo that he could hardly procure a quantity ſufficient to make experiments upon. Fourcroy alſo tells us, that "Mr Sage, having treated this ore with ſal-ammoniac, obtained iron, copper, and cobalt, and thinks that it is compoſed of theſe three metallic matters, together with arſenic. It likewiſe contains a ſmall proportion of gold, according to this chemiſt. It is proper to obſerve, that theſe reſults do not agree with thoſe of Mr Bergman; he is ſaid to have operated on the *kupfer-nickel* of Biber, in Heſſe, and of Alemont in Dauphiny. Mr Bergman himſelf, however, informs us, that he undertook his experiments expreſsly with a view to diſcover whether the theory of Mr Sage was juſt; and that he operated moſtly on ſome regulus made by Mr Cronſtedt, and found in the Suabian collection.

"Cronſtedt (ſays Mr Fourcroy) aſſures us, that the metallic matter, called *ſpeiſs* by the Germans, which is collected in the crucibles uſed in the melting of ſmalt, affords nickel. Mr Monnet thinks, that the ſpeiſs of the manufacture of Gengenback, 14 leagues from Straſburg, is true nickel: and as the ore of cobalt made uſe of in that place to make ſmalt is very pure, he concludes, that nickel is neceſſarily a product of cobalt, itſelf. But Mr Beaumé has obtained nickel from almoſt all the ores of cobalt by means of ſulphur; it therefore ſeems, that the ore of cobalt, which is wrought at Gengenback, contains nickel not diſtinguiſhable by the eye, on account of the intimate union of theſe two metallic matters."

"To obtain the regulus of nickel (ſays Mr Bergman, the ore muſt be firſt ſubjected to roaſting; during which a quantity of ſulphur and arſenic, greater or leſs according to the nature of the ore, is expelled; ſo that it ſometimes loſes above half its weight, but frequently not above 0.3. This ore, though long and completely calcined, does not always acquire the ſame colour, but in general becomes greener in proportion as it is more rich. Sometimes (eſpecially if ſuffered to lie at reſt) its upper ſurface is covered with green vegetations, ſomewhat of the form of coral, which are hard and ſonorous. A double or a triple quantity of black flux is to be added to the roaſted powder, and the mixture well fuſed in a forge in an open crucible covered with common ſalt, in the uſual method. The veſſel being broken, a metallic globule is found at the bottom, the weight of which amounts to 0.1, 0.2, or at the moſt to 0.5 of the crude ore. The regulus thus obtained, however, is far from being pure; for although the roaſting be ever ſo violent and long continued, yet a conſiderable quantity of ſulphur, but eſpecially arſenic, ſtill remains concealed, excluſive of cobalt, and a great proportion of iron; which laſt is ſo generally prevalent as to make the regulus magnetic: and this variety of heterogeneous matter is the cauſe why the regulus varies much, not only in reſpect to its fracture, the poliſhed ſurface of which is either ſmooth or lamellated, but alſo in regard to its white colour, which is more or leſs yellow or red.

He has not been able to determine the properties of nickel when perfectly pure, as the continual preſence of iron in ſome reſpect obſcures them: From the calculations which he makes, however, Mr Bergman concludes that the ſpecific gravity of nickel is not leſs than 9.000 at the leaſt. If a ſmall portion of gold enter the compoſition, the greatneſs of the weight might thence be explained; but though this metal is almoſt always abſent, yet 36 parts of it, 48 of iron, and one of copper, were formed by fuſion into a globule, the ſpecific gravity of which was 8.8571, but was little ſoluble in nitrous acid; yet after lying about two hours in the acid, the gold was plainly to be ſeen, and with volatile alkali the menſtruum yielded nothing but a ferruginous brown precipitate, which in the fire put on the appearance of calcined iron.

The ſolutions of nickel in all the acids are green. The vitriolic ſcarcely attacks the regulus unleſs by evaporation to dryneſs. The nitrous acid, by the aſſiſtance of heat, diſſolves both the calx and the regulus: as does likewiſe the marine acid, but ſlowly, and not without the aſſiſtance of heat. Acid of arſenic unites with the calx into a green ſaline maſs; but with the regulus it ſeparates a ſaline powder difficult of fuſion. Fluor acid diſſolves the calx with difficulty, and forms cryſtals of a diluted green colour. Acid of borax ſcarce diſſolves nickel directly, but takes it up by a double elective attraction. Vinegar forms with the calx ſpathoſe cryſtals of an intenſe green colour, which can ſcarce be decompoſed by acid of tartar. The ſaccharine acid converts both regulus and calx into a white powder, not eaſily ſoluble in water. Acid of phoſphorus attracts it but little. The acid of ants by decoction or long digeſtion, attacks the newly precipitated calx; for the ſolution is green and upon evaporation yields cryſtals of a deep green colour, hemiſpherical, formed of filaments diverging from a centre and pellucid. They are not ſoluble in ſpirit of wine, and ſcarcely in water, unleſs it be acidulated. Lemon juice ſeems not to act at all upon nickel. All the acids are deeply tinged by diſſolving nickel; and this property belongs to the firſt regulus as well as that which is moſt highly depurated. Volatile alkali diſſolves it, and the ſolution is of a blue colour; the fixed alkali diſſolves it very ſparingly, and forms a yellow ſolution.

Nickel becomes the more difficult of fuſion, in proportion to its purity, ſo that at laſt it requires nearly as great a heat for this purpoſe as malleable iron. It is eaſily melted with other metals, but its great ſcarcity has prevented this matter from being thoroughly inveſtigated. "It may, however, be obſerved, that the impure regulus cannot be united with ſilver, which muſt be attributed to the cobalt it contains; for when well freed from that metal, it eaſily unites in equal proportions with ſilver, and that without any remarkable diminution of the whiteneſs or ductility of the latter. This mixture, fuſed with borax, tinges it of an hyacinthine colour. Copper unites more ſlowly with depurated nickel, yielding a red and ductile metallic maſs, which tinges borax of a reddiſh hyacinthine colour. It produces only a brittle maſs with tin; in which reſpect it differs from cobalt. It could not be amalgamated with mercury by trituration.

Nickel, when well depurated, does not eaſily part with its phlogiſton, or, in the language of the new nomenclature, receive an acceſſion of carbone; for it only aſſumes a brown colour, and that with great difficulty in the ordinary way of calcination in the aſſay furnace. By means of nitre, however, it is more completely dephlogiſticated, and becomes green. The metallic calx, vitrified with borax, produces an hyacinthine tinge; which yet, if occaſioned by a regulus not well depurated, vaniſhes on continuing the fire, a ſlight blue tinge being produced by the addition of nitre; but a calx of well depurated regulus of nickel forms a permanent colour. The calx of nickel communicates alſo a hyacinthine colour to microcoſmic ſalt; which, by long continued fuſion on charcoal, may indeed be weakened, but can hardly be quite diſcharged. On the addition of nitre it changes to a violet, but becomes again hyacinthine on augmenting the quantity of microcoſmic ſalt. If the calx of nickel be added to ſaturation, the fuſed glaſs aſſumes a blood colour; but on being fuſed, becomes more and more yellow.

Under the article CHEMISTRY, N° 1316, and in the preſent article, we have obſerved, that Mr Bergman conjectures nickel to be only a modification of iron. He examines, however, with great care, the opinion of other authors, who ſuppoſe it to be compoſed of arſenic, copper, cobalt, and iron.—"With reſpect to arſenic (ſays he) we may very ſafely exclude it from the number; as experiments ſhow that it may be entirely expelled. It cannot be doubted but that copper is preſent in ſome ores of nickel, and therefore may eaſily be mixed with the regulus; but the greater number are entirely without it. It is true, that nickel is totally ſoluble in volatile alkali, and that this ſolution is of a blue colour; but if this argument held good, there would be nothing found here but copper; in which caſe very different phenomena would take place from thoſe which are produced by nickel. The blue colour, produced both by copper and nickel, can no more prove their identity than the yellow colour produced both by gold and iron, when diſſolved in aqua regia, can prove the identity of theſe two metals. Nickel and copper agree alſo in this property, that they are both precipitated from acids and from volatile alkali by iron; but a conſiderable difference appears in the manner in which this precipitation is accompliſhed. When a poliſhed piece of iron is put into a ſolution of nickel, a yellow pellicle of the latter will by degrees adhere to it; but this ſoon diſappears on touching, and grows black, unleſs the acid be well ſaturated, or ſufficiently diluted with water. A ſimilar precipitation is obſerved if zinc be made uſe of inſtead of iron; but in ſolution of copper ſo much diluted, that the precipitation on iron may be nearly ſimilar to that of nickel, zinc is immediately covered with a cruſt of the colour of mountain braſs."

An invincible argument that cobalt is no eſſential ingredient in nickel is, that a ſolution of the latter in hepar ſulphuris is precipitated by the former. In the ſame way nickel tinging borax, or the microcoſmic ſalt, in the dry way, is thrown down by the addition of a proper quantity of copper; but this is not the caſe with cobalt. A remarkable difference likewiſe occurs with all the acids. 1. Cobalt tinges all theſe menſtrua of a red colour, yielding cryſtals either of a yellow or bluiſh red. But nickel produces ſolutions and concretions of a fine green; it ſometimes happens, indeed, that the red ſolutions yield greeniſh cryſtals; but this is to be attributed to nickel in ſmall proportion mixed with the cobalt. 2. Cobalt united with the marine acid yields ſympathetic ink, but depurated nickel does not. 3. Cobalt, diſſolved in volatile alkali, affords a red ſolution, but nickel diſſolved in the ſame alkali is blue. 4. Cobalt does not, like nickel, ſeparate, on the addition of arſenical acid, a powder difficult of ſolution. Iron therefore only remains; and indeed, ſays Mr Bergman, there are many and weighty reaſons, which induce us to think that nickel, cobalt, and mangeneſe, are perhaps to be conſidered in no other light than modifications of iron.

1. Unequal portions of phlogiſton, united to the ſame iron, or, according to the new nomenclature, iron containing different proportions of carbone, changes its qualities in a remarkable manner: for inſtance, how very much do the different kinds of iron and ſteel differ? It is then to be obſerved, that nickel, cobalt, and mangeneſe, whatever operations they may be ſubjected to, are ſo far from being deprived of iron, on the contrary, they thereby become more ductile, magnetic, and refractory. Again, The various colours which nickel, cobalt, and mangeneſe exhibit, both by ſolution and by fire, are alſo exhibited by iron. Cobalt and mangeneſe occaſion a red colour in acids, and the latter in glaſs; nickel and mangeneſe occaſion a hyacinthine colour when fuſed with borax; a green is produced in acids by nickel, as alſo by its calx, and by mangeneſe when long and ſtrongly calcined; and it often leaves behind a ſcoria of the ſame colour, if the reduction be performed with a ſaline flux. Laſtly, Cobalt occaſions a blue or rather violet colour in glaſs; and the ſame is true of mangeneſe diſſolved in fixed, and of nickel in volatile, alkali. Iron exhibits all theſe varieties; for the acids form with this metal ſolutions of a green colour as long as it contains a certain quantity of phlogiſton; but in proportion to the diminution of this principle, a yellow, red, or browniſh red, colour is produced. It tinges glaſs in the ſame manner, green, yellow, black, or red. Expoſed to the fire for many hours together with nitre, blue, greeniſh blue, or greeniſh purple flowers, indeed are tranſmitted through the crucible; but an effloreſcence of the ſame kind is produced by nitre alone, which, by long continued fire, penetrates the veſſels, and is decompoſed by the contact of the burning fuel, the alkaline efflo-

Nickel
Nicobar.

reſcences being made blue by the manganeſe, which is always preſent in the circumjacent aſhes; and theſe verge more to a green in proportion as the crocus martis is more copious; beſides, iron itſelf is often found mixed with manganeſe. Hence therefore it appears, that the blue flowers which are expelled from nickel by means of nitre are the produce of manganeſe, as theſe impart to glaſs nothing of the cobalt colour; beſides, in the mineral kingdom, we find the nephritic ſtones, and many others of blue, yellow, red, and green colours, all proceeding from iron alone.

The ores already mentioned, from which nickel has been obtained, are as follow:

1. Mr Rinman aſſerts, that it has been found native in a mine of cobalt in Heſſe. It is very heavy, and of a liver colour or dark red. When pulverized, and roaſted under a muffle, it forms green excreſcences, and ſmokes; but its ſmoke has no particular ſmell, nor can any ſublimate, either ſulphureous or arſenical, be caught. It is ſoluble in acids, and the ſolution is green, but a poliſhed iron plate diſcovers no copper.

2. Aerated nickel is found in form of a calx, and is commonly mixed with the calx of iron; in which caſe it has the name of *nickel-ochre*. This is green, and is found in form of flowers on *kupfer-nickel*. It has been found in Sweden, without any viſible quantity of nickel in its compoſition, in clay which contained much ſilver.

3. *Kupfer-nickel* is of a reddiſh yellow bright colour, as has already been mentioned, and its texture is either uniform, granular, or ſcaly. It is bright when broken, very heavy, and generally covered with a greeniſh efflореſcence. By calcination it loſes much of its ſulphur, and becomes green, forming fungous ramifications. Mr Raſpe informed M. Magellan, that nickel was found mineralized with ſulphurated iron and copper in a mine near Nelſton in Cornwall. The fine grained and ſcaly kinds are found in looſe cobalt mines in the province of Helſingeland in Sweden, where they are of a lighter colour than in other countries, and have often been confounded with the liver-coloured marcaſite.

4. Nickel mineralized with the acid of vitriol is of a beautiful green colour, and may be extracted from the nickel-ochre, or green eſfloreſcences of kupfer-nickel already mentioned.

To the properties of nickel already mentioned, we may add that of its being conſtantly attracted by the magnet, and that not at all in proportion to the quantity of iron it contains; for the more it is purified from this metal, the more magnetical it becomes; and even acquires what iron does not, viz. the properties of a true loadſtone.

NICOBAR ISLANDS, the name of ſeveral iſlands in Aſia, lying at the entrance of the gulf of Bengal. The largeſt of theſe iſlands is about 40 miles long and 15 broad, and the inhabitants are ſaid to be a harmleſs ſort of people, ready to ſupply the ſhips that ſtop there with proviſions. The ſouth end of the great Nicobar is by Captain Ritchie placed in eaſt longitude 94° 23′ 30″; and we collect from Mr Rennel's Memoir, that it is within the 12th degree of north latitude.

Of theſe iſlands very little that can be depended upon is known in Europe. Of the northernmoſt, which is called *Carnicobar*, we have indeed, in the ſecond volume of the Aſiatic Reſearches, ſome intereſting information reſpecting both the produce and natural hiſtory of the country, and the manners of its inhabitants. The author of the memoir is Mr G. Hamilton, who, in his account of this iſland, ſays, "It is low, of a round figure, about 40 miles in circumference, and appears at a diſtance as if entirely covered with trees: however, there are ſeveral well cleared and delightful ſpots upon it. The ſoil is a black kind of clay, and marſhy. It produces in great abundance, and with little care, moſt of the tropical fruits, ſuch as pine-apples, plantains, papayes, cocoa-nuts, and areca-nuts; alſo excellent yams, and a root called *cachu*. The only four-footed animals upon the iſland are, hogs, dogs, large rats, and an animal of the lizard kind, but large, called by the natives *tolonqui*; theſe frequently carry off fowls and chickens. The only kind of poultry are hens, and thoſe not in great plenty. There are abundance of ſnakes of many different kinds, and the inhabitants frequently die of their bites. The timber upon the iſland is of many ſorts, in great plenty, and ſome of it remarkably large, affording excellent materials for building or repairing ſhips.

Nicobar.

"The natives are low in ſtature but very well made, and ſurpriſingly active and ſtrong; they are copper coloured, and their features have a caſt of the Malay, quite the reverſe of elegant. The women in particular are extremely ugly. The men cut their hair ſhort, and the women have their heads ſhaved quite bare, and wear no covering but a ſhort petticoat, made of a ſort of ruſh or dry graſs, which reaches half way down the thigh. This graſs is not interwoven, but hangs round the perſon ſomething like the thatching of a houſe. Such of them as have received preſents of cloth petticoats from the ſhips, commonly tie them round immediately under the arms. The men wear nothing but a narrow ſtrip of cloth about the middle, in which they wrap up their privities ſo tight that there hardly is any appearance of them. The ears of both ſexes are pierced when young; and by ſqueezing into the holes large plugs of wood, or hanging heavy weights of ſhells, they contrive to render them wide, and diſagreeable to look at. They are naturally diſpoſed to be good humoured and gay, and are very fond of ſitting at table with Europeans, where they eat every thing that is ſet before them; and they eat moſt enormouſly. They do not care much for wine, but will drink bumpers of *arack* as long as they can ſee. A great part of their time is ſpent in feaſting and dancing. When a feaſt is held at any village, every one that chooſes goes uninvited, for they are utter ſtrangers to ceremony. At thoſe feaſts they eat immenſe quantities of pork, which is their favourite food. Their hogs are remarkably fat, being fed upon the cocoa nut kernel and ſea water; indeed all their domeſtic animals, fowls, dogs, &c. are fed upon the ſame. They have likewiſe plenty of ſmall ſea fiſh, which they ſtrike very dexterouſly with lances, wading into the ſea about knee deep They are ſure of killing a very ſmall fiſh at 10 or 12 yards diſtance. They eat the pork almoſt raw, giving it only a haſty grill over a quick fire. They roaſt a fowl. by running a piece of wood through it, by way of ſpit, and holding it over a briſk fire until the feathers are burnt off, when it is ready for eating, in their taſte. They never drink water; only cocoa-nut milk and a liquor called *ſoura*, which oozes from the cocoa-nut tree after cutting off the young ſprouts or flowers. This they ſuffer to ferment before it be uſed, and then it is intoxicating; to which quality they add much by their method of drinking it, by ſucking it ſlowly through a ſmall ſtraw. After eating, the young men and women, who are fancifully dreſſed with leaves, go to dancing, and the old people ſurround them ſmoking tobacco and drinking *ſoura*. The dancers, while performing, ſing ſome of their tunes, which are far from wanting harmony, and to which they keep exact time. Of muſical inſtruments they have only one kind, and that the ſimpleſt. It is a hollow bamboo about 2½ feet long and three inches in diameter, along the outſide of which there is ſtretched from end to end a ſingle ſtring made of the threads of a ſplit cane, and the place under the ſtring is hollowed a little to prevent it from touching. This inſtrument is played upon in the ſame manner as a guitar. It is capable of producing but few notes; the performer however makes it ſpeak harmoniouſly, and generally accompanies it with the voice.

" Their houſes are generally built upon the beach, in villages of 15 or 20 houſes each; and each houſe contains a family of 20 perſons and upwards. Theſe habitations are raiſed upon wooden pillars about 10 feet from the ground; they are round, and, having no windows, are like bee-hives, covered with thatch. The entry is through a trap door below, where the family mount by a ladder, which is drawn up at night. This manner of building is intended to ſecure the houſes from being infeſted with ſnakes and rats; and for that purpoſe the pillars are bound round with a ſmooth kind of leaf, which prevents animals from being able to mount; beſides which, each pillar has a broad round flat piece of wood near the top of it, the projecting of which effectually prevents the further progreſs of ſuch vermine as may have paſſed the leaf. The flooring is made with thin ſtrips of bamboos, laid at ſuch diſtances from one another as to leave free admiſſion for light and air; and the inſide is neatly finiſhed and decorated with fiſhing lances, nets, &c.

" The art of making cloth of any kind is quite unknown to the inhabitants of this iſland; what they have is got from the ſhips that come to trade in cocoa-nuts.

" They purchaſe a much larger quantity of cloth than is conſumed upon their own iſland. This is intended for the Choury market. Choury is a ſmall iſland to the ſouthward of theirs, to which a large fleet of their boats ſails every year about the month of November, to exchange cloth for canoes; for they cannot make theſe themſelves. This voyage they perform by the help of the ſun and ſtars, for they know nothing of the compaſs.

" In their diſpoſition there are two remarkable qualities. One is their entire neglect of compliment and ceremony; and the other, their averſion to diſhoneſty. A Carnicobarian travelling to a diſtant village, upon buſineſs or amuſement, paſſes through many towns in his way without ſpeaking to any one; if he is hungry or tired, he goes into the neareſt houſe, and helps himſelf to what he wants, and ſits till he is reſted, without taking the ſmalleſt notice of any of the family unleſs he has buſineſs or news to communicate. Theft or robbery is ſo very rare amongſt them, that a man going out of his houſe never takes away his ladder or ſhuts his door, but leaves it open for any body to enter that pleaſes, without the leaſt apprehenſion of having any thing ſtolen from him.

" Their intercourſe with ſtrangers is ſo frequent, that they have acquired in general the barbarous Portugueſe ſo common over India; their own language has a ſound quite different from moſt others, their words being pronounced with a kind of ſtop, or catch in the throat, at every ſyllable.

" They have no notion of a God, but they believe firmly in the devil, and worſhip him from fear. In every village there is a high pole erected with long ſtrings of ground rattans hanging from it, which, it is ſaid, has the virtue to keep him at a diſtance. When they ſee any ſigns of an approaching ſtorm, they imagine that the devil intends them a viſit, upon which many ſuperſtitious ceremonies are performed. The people of every village march round their own boundaries, and fix up at different diſtances ſmall ſticks ſplit at the top, into which ſplit they put a piece of cocoa-nut, a wiſp of tobacco, and the leaf of a certain plant; whether this is meant as a peace offering to the devil, or a ſcarecrow to frighten him away, does not appear.

" When a man dies, all his liveſtock, cloth, hatchets, fiſhing lances, and in ſhort every moveable thing he poſſeſſed, is buried with him, and his death is mourned by the whole village. In one view this is an excellent cuſtom, ſeeing it prevents all diſputes about the property of the deceaſed amongſt his relations. His wife muſt conform to cuſtom by having a joint cut off from one of her fingers; and if ſhe refuſes this, ſhe muſt ſubmit to have a deep notch cut in one of the pillars of her houſe.

" I was once preſent at the funeral of an old woman. When we went into the houſe which had belonged to the deceaſed, we found it full of her female relations; ſome of them were employed in wrapping up the corpſe in leaves and cloth, and others tearing to pieces all the cloth which had belonged to her. In another houſe hard by, the men of the village with a great many others from the neighbouring towns, were ſitting drinking *ſoura* and ſmoking tobacco. In the mean time two ſtout young fellows were buſy digging a grave in the ſand near the houſe. When the women had done with the corpſe, they ſet up a moſt hideous howl, upon which the people began to aſſemble round the grave, and four men went up into the houſe to bring down the body; in doing this they were much interrupted by a young man, ſon to the deceaſed, who endeavoured with all his might to prevent them, but finding it in vain, he clung round the body, and was carried to the grave along with it: there, after a violent ſtruggle, he was turned away and conducted back to the houſe. The corpſe being now put into the grave, and the laſhings which bound the legs and arms cut, all the live ſtock which had been the property of the deceaſed, conſiſting of about half a dozen hogs, and as many fowls, was killed, and flung in above it; a man then approached with a bunch of leaves ſtuck upon the end of a pole, which he ſwept two or three times gently along the corpſe, and then the grave was filled up. During the ceremony, the women continued to make the moſt horrible vocal concert imaginable: the men ſaid nothing. A few days afterwards, a kind of monument was erected over the grave, with a pole upon it, to which long ſtrips of cloth of different colours were hung.

"Polygamy is not known among them; and their puniſhment of adultery is not leſs ſevere than effectual. They cut, from the man's offending member, a piece of the foreſkin proportioned to the frequent commiſſion or enormity of the crime.

"There ſeems to ſubſiſt among them a perfect equality. A few perſons, from their age, have a little more reſpect paid to them; but there is no appearance of authority one over another. Their ſociety ſeems bound rather by mutual obligations continually conferred and received; the ſimpleſt and beſt of all ties."

It is our wiſh to take all opportunities of laying before our readers every authentic fact which can throw light upon the philoſophy of the human mind. In this narrative of Mr Hamilton's reſpecting the natives of Carnicobar, there is however one circumſtance at which we ſtumble. It is known to the learned, that the philoſophers of Greece and Rome, as well as the magi of Perſia, admitted two ſelf-exiſtent beings, a good and an evil (ſee Polytheism); but we never before read of any people who had no notion of a God, and yet firmly believed in the devil. We could give inſtances of men worſhipping the evil principle from fear, and neglecting the worſhip of the benevolent principle from a perſuaſion that he would do them all the good in his power without being bribed by ſacrifices and oblations; but this is the only inſtance of which we have ever heard, of a people, under the influence of religion, who had *no notion of a God!* As good is at leaſt as apparent in the world as evil, it appears to us ſo very unnatural to admit an *evil* and deny a *good* principle, that we cannot help thinking that Mr Hamilton, from his ignorance of the language of Carnicobar, (which he acknowledges to be different from moſt others), has not a perfect acquaintance with the religious creed of the natives: and that they believe in a good as well as in an evil principle, though they worſhip only the latter, from a perſuaſion, that to adore the former could be of no advantage either to him or to themſelves.

NICODEMUS, a diſciple of Jeſus Chriſt, a Jew by nation, and by ſect a Phariſee (John iii. 1. &c.) The Scripture calls him a ruler of the Jews, and our Saviour gives him the name of a maſter of Iſrael. When our Saviour began to manifeſt himſelf by his miracles at Jeruſalem, at the firſt paſſover that he celebrated there after his baptiſm, Nicodemus made no doubt but that he was the Meſſiah, and came to him by night, that he might learn of him the way of ſalvation. Jeſus told him, that no one could ſee the kingdom of heaven except he ſhould be born again. Nicodemus taking this in the literal ſenſe, made anſwer, "How can a man that is old be born again? Can he enter a ſecond time into his mother's womb?" To which Jeſus replied, "If a man be not born of water and of the ſpirit, he cannot enter into the kingdom of God. That which is born of the fleſh is fleſh, and that which is born of the ſpirit is ſpirit." Nicodemus aſks him, "How can theſe things be?" Jeſus anſwered, "Are you a maſter of Iſrael, and are you ignorant of theſe things? We tell you what we know, and you receive not our teſtimony. If you believe not common things, and which may be called earthly, how will you believe me if I ſpeak to you of heavenly things? Nobody has aſcended into heaven but the Son of God, who came down from thence. And juſt as Moſes lifted up the brazen ſerpent in the wilderneſs, ſo muſt the Son of Man be lifted up on high. For God ſo loved the world that he has given his only Son, ſo that no man who believes in him ſhall periſh, but ſhall have eternal life."

After this converſation Nicodemus became a diſciple of Jeſus Chriſt; and there is no doubt to be made, but he came to hear him as often as our Saviour came to Jeruſalem. It happened on a time, that the prieſts and Phariſees had ſent officers to ſeize Jeſus (John vii. 45, &c.), who returning to them, made their report, that never man ſpoke as he did; to which the Phariſees replied, "Are you alſo of his diſciples? Is there any one of the elders or Phariſees that have believed in him?" Then Nicodemus thought himſelf obliged to make anſwer, ſaying, "Does the law permit us to condemn any one before he is heard?" To which they replied, "Are you alſo a Galilean? Read the Scriptures, and you will find that never any prophet came out of Galilee." After this the council was diſmiſſed. At laſt Nicodemus declared himſelf openly a diſciple of Jeſus Chriſt (*Id.* xix. 39, 40.), when he came with Joſeph of Arimathea to pay the laſt duties to the body of Chriſt, which they took down from the croſs, embalmed, and laid in a ſepulchre.

We are told, that Nicodemus received baptiſm from the diſciples of Chriſt; but it is not mentioned whether before or after the paſſion of our Lord. It is added, that the Jews being informed of this, depoſed him from his dignity of ſenator, excommunicated him, and drove him from Jeruſalem: but that Gamaliel, who was his couſin-german, took him to his country houſe, and maintained him there till his death, when he had him buried honourably near St Stephen. There is ſtill extant an apocryphal goſpel under the name of Nicodemus, which in ſome manuſcripts bears the title of the *Acts of Pilate*.

NICOLAITANS, in church hiſtory, Chriſtian heretics who aſſumed this name from Nicholas of Antioch; who, being a Gentile by birth, firſt embraced Judaiſm and then Chriſtianity; when his zeal and devotion recommended him to the church of Jeruſalem, by whom he was choſen one of the firſt deacons. Many of the primitive writers believe that Nicholas was rather the occaſion than the author of the infamous practices of thoſe who aſſumed his name, who were expreſsly condemned by the Spirit of God himſelf, Rev. ii. 6. And indeed their opinions and actions were highly extravagant and criminal. They allowed a community of wives, and made no diſtinction between ordinary meats and thoſe offered to idols. According to Euſebius, they ſubſiſted but a ſhort time; but Tertullian ſays, that they only changed their name, and that their hereſies paſſed into the ſect of the Cainites.

NICOLAS (St), an iſland of the Atlantic ocean, and one of the moſt conſiderable of thoſe of Cape Verde, lying between Santa Lucia and St Jago. It is a triangular figure, and about 75 miles in length. The land is ſtony, mountainous, and barren; but there are a great many goats in a valley inhabited by the Portugueſe. W. Long. 33. 35. N. Lat. 17. 0.

NICOLE (Peter), one of the fineſt writers in Europe, was born at Chartres in 1625, of a conſpicuous family. He adhered to the Janſeniſts; and joined in the compoſition of ſeveral works with Mr Arnauld, whoſe faithful companion he was during the 10 or 12 years of his retirement. He gave a Latin tranſlation of Paſcal's *Provinciales*, and added a commentary to them. One of his fineſt works is his *Eſſais de Morale*. He wrote very ſubtilely againſt the Proteſtants. His treatiſe on the unity of the church is eſteemed a maſterly piece. He died at Paris in 1695, a few days after the publication of his treatiſe concerning the Quietiſts. He was well ſkilled in polite literature. To him is aſcribed a collection of Latin epigrams, and of Greek, Spaniſh, and Italian ſentences, which has borne ſeveral impreſſions, and has a learned preface to it.

NICOLO (St), the moſt conſiderable, ſtrongeſt, and beſt peopled of the iſles of Tremeti in the gulf of Venice, to the eaſt of St Domino, and to the ſouth of Capparata. It has a harbour defended by ſeveral towers; and a fortreſs, in which is an abbey, with a very handſome church. E. Long. 15. 37. N. Lat. 42. 7.

NICOMEDES, the name of ſeveral kings of the ancient Bithynia. See BITHYNIA.

NICOMEDES I. had no ſooner taken poſſeſſion of his father's throne, before Chriſt 270, than, according to the cuſtom which has in all ages been too prevalent among the deſpots of the eaſt, he cauſed two of his brothers to be put to death. The youngeſt, Zibœas, having ſaved himſelf by timely flight, ſeized on the coaſt of Bithynia, which was then known by the names of *Thracia Thyniccia*, and *Thracia Aſiatica*, and there maintained a long war with his brother. Nicomedes being informed that Antiochus Soter, king of Syria, was making great preparations to attack him at the ſame time, called in the Gauls to his aſſiſtance; and on this occaſion that people firſt paſſed into Aſia.—Nicomedes having with their aſſiſtance repulſed Antiochus, overcome his brother, and acquired the poſſeſſion of all his father's dominions, beſtowed upon them that part of Aſia Minor which from them was called *Gallo-Græcia*, and Gallatia. Having now no enemies to contend with, he applied himſelf to the enlarging and adorning of the city of Aſtacus, which he called after his own name *Nicomedia*. He had two wives, and by one of them he was perſuaded to leave his kingdom to her ſon, in preference to his elder brothers; but when or how he died is not certainly known.

NICOMEDES II. the grandſon of the former, began his reign like him, by ſacrificing his brothers to his jealouſy, after having waded to the throne in the blood of Pruſias his father. He aſſumed the name of *Epiphanes*, or "the Illuſtrious," though he performed nothing worthy of this title, or even of notice, during the whole time of his long reign. He was ſucceeded by his ſon——

NICOMEDES III. ſurnamed, by antiphraſis, *Philopater*, becauſe he had murdered his father to get poſſeſſion of his crown. This monarch having entered into alliance with Mithridates the Great king of Pontus, invaded Paphlagonia; and having ſeized on that country, he attempted likewiſe to make himſelf maſter of Cappadocia. This country, however, was at that time ſubject to his powerful ally; who thereupon marching into Bithynia at the head of an army, drove Nicomedes from the throne, and raiſed his brother Socrates to it in his room. The dethroned prince had recourſe to the Romans, who expelled the uſurper, and reſtored him to his hereditary dominions. For this favour they preſſed him, and at length prevailed upon him, contrary to his own inclination, and the opinion of his friends, to make inroads into the territories of Mithridates, with whom Rome wanted a ſubject of diſpute. The king of Pontus bore for ſome time the devaſtations committed by Nicomedes with great patience, that he might not ſeem to be the aggreſſor; but at laſt he routed his army on the banks of the Amnius, drove him a ſecond time from his dominions, and obliged him to ſeek for ſhelter in Paphlagonia, where he led a private life till the time of Sylla, who replaced him on the throne. He was ſucceeded by his ſon——

NICOMEDES IV. who performed nothing which the many writers who flouriſhed in his time have thought worth tranſmitting to poſterity. As he died without iſſue male, he left his kingdom by his laſt will to the Romans, who reduced it to the form of a province. Salluſt, diſagreeing with the ancients, tells us, that Nicomedes left a ſon named *Muſa* or *Myſa*; and introduces Mithridates as complaining of the Romans to Arſaces king of Parthia, for ſeizing on the kingdom of Bithynia, and excluding the ſon of a prince who had on all occaſions ſhown himſelf a ſteady friend to their republic. But this Muſa was the daughter and not the ſon of Nicomedes, as we are told in expreſs terms by Suetonius, Velleius Paterculus, and Appian. All we know of her is, that upon the death of her father ſhe claimed the kingdom of Bithynia for her ſon, as the next male heir to the crown, but without ſucceſs; no motives of juſtice being of ſuch weight with the ambitious Romans as to make them part with a kingdom.

NICOMEDIA (anc. geog.), metropolis of Bithynia, built by Nicomedes the grandfather of Pruſias. Situated on a point of the Sinus Aſtacenus, (Pliny); ſurnamed the *Beautiful*, (Athenæus): the largeſt city of Bithynia, (Pauſanias), who ſays it was formerly called *Aſtacus*; though Pliny diſtinguiſhes Aſtacum and Nicomedia as different cities. Nicomedia was very famous, not only under its own kings, but under the Romans: it was the royal reſidence of Diocleſian, and of Conſtantine while Conſtantinople was building, if we may credit Nicephorus. It is ſtill called *Nicomedia*, at the bottom of a bay of the Propontis in the Hither Aſia. E. Long. 30. 0. N. Lat. 41. 20.

It is a place of conſequence; carries on a trade in ſilk, cotton, glaſs, and earthen ware, and is the ſee of a Greek archbiſhop.

NICOMEDUS, a geometrician, famous on account of the invention of the curve called *conchoid*, which is equally uſeful in reſolving the two problems of doubling the cube and triſecting the angle. It appears that he lived ſoon after Eratoſthenes, for he rallied that philoſopher on the mechaniſm of his meſolabe. Geminus, who lived in the ſecond century before Jeſus Chriſt, has written on the conchoid, though Nicomedus was always eſteemed the inventor of it. Thoſe who place him four or five centuries after Jeſus Chriſt muſt be ignorant of theſe facts, by which we are enabled to aſcertain pretty nearly the time in which he lived.

NICON, a native of Ruſſia, was born in 1613, in a village of the government of Niſhnei Novogorod, of ſuch obſcure parents, that their names and ſtation are not tranſmitted to poſterity. He received at the baptiſmal font the name of *Nikita*, which afterwards, when he became monk, he changed to *Nicon*, the appellation by which he is more generally known. He was educated in the convent of St Macarius, under the care of a monk. From the courſe of his ſtudies, which were almoſt ſolely directed to the Holy Scriptures, and the exhortations of his preceptor, he imbibed at a very early period the ſtrongeſt attachment to a monaſtic life; and was only prevented from following the bent of his mind by the perſuaſions and authority of his father. In conformity, however, to the wiſhes of his family, though contrary to his own inclination, he entered into matrimony; and, as that ſtate precluded him from being admitted into a convent, he was ordained a ſecular prieſt. With his wife he continued ten years, partly in the country and partly at Moſcow, officiating as a pariſh prieſt. The loſs of three children, however, gave him a total diſguſt to the world; in conſequence of which, his wife was perſuaded to take the veil, and he became a monk; his retreat was in an iſland of the White ſea, and a kind of eccleſiaſtical eſtabliſhment was formed, as remarkable for the auſterities of its rules as the ſituation was for its ſolitude. There were about 12 monks, but they all lived in different cells. Such a ſyſtem, combined with the moſt gloomy ideas, occaſioned ſo much cloiſtered pride as tarniſhed his character, when he was afterwards called up to fulfil the duties of a public and exalted ſtation. Our limits do not permit us to be minute in our account of his life, we muſt therefore be contented with barely reciting general facts. Within leſs than the ſpace of five years, Nicon was ſucceſſively created archimandrite, or abbot of the Novoſpatſkoi convent, archbiſhop of Novogorod, and patriarch of Ruſſia. That he was worthy of theſe rapid promotions, few will doubt who are acquainted with his character; for he was poſſeſſed of very extraordinary qualities, ſuch as even his enemies allow and admire. His courage was undaunted, his morals irreproachable, his charity extenſive and exalted, his learning deep and comprehenſive, and his eloquence commanding.—When archbiſhop, he obtained the reſpect of the inhabitants by his unwearied aſſiduity in the diſcharge of his truſt; and conciliated their affections by acts of unbounded charity: Nor was he leſs conſpicuous in the diſcharge of the office of patriarch, to which dignity he was appointed in 1652, in the 39th year of his age.

Nor was he only diſtinguiſhed in his own profeſſion, for he ſhone even as a ſtateſman. At length, however, he fell a victim to popular diſcontents; which misfortune, though he was far from deſerving it, was cer[illegible] the effect of imprudence. He abdicated the offi[illegible] patriarch, which would otherwiſe have been taken from him, in July 1658, and bore his reverſe of fortune with heroic magnanimity: he returned to a cell, and commenced his former auſterities. His innocence, however, could not protect him from further malice: his enemies obtained him to be formally depoſed in 1666. This degradation was followed by impriſonment, which was for ſome time very rigorous, becauſe he, conſcious of his own innocence, refuſed to accept pardon for crimes of which he was not guilty. In 1676, however, he was removed to the convent of St Cyril, and enjoyed perfect liberty.

Nicon ſurvived his depoſition 15 years. In 1681, he requeſted and obtained permiſſion to return to the convent of Jeruſalem, that he might end his days in that favourite ſpot; but he expired upon the road near Yaroſlaf, in the 66th year of his age. His remains were tranſported to that convent, and buried with all the ceremonies uſed at the interment of patriarchs.

NICOPOLI, a town of Turkey in Europe, and in Bulgaria, famous for being the place where the firſt battle was fought between the Turks and Chriſtians in 1396; and where the latter were defeated with the loſs of 20,000 men. E. Long. 25. 33. N. Lat. 43. 46.

NICOSIA, the capital of the iſland of Cyprus, where a Turkiſh baſhaw reſides. It is delightfully ſituated between the mountains of Olympus and a chain of others, and was formerly well fortified by the Venetians; but the works are now in ruins. It is about 31 miles in circumference; and there are plantations of olives, almonds, lemons, oranges, mulberries, and cypreſs trees, interſperſed among the houſes, which give the town a delightful appearance. The church of Sancta Sophia is an old Gothic ſtructure, which the Turks have turned into a moſque, and deſtroyed the ornaments. It is 100 miles weſt of Tripoli, and 160 ſouth-weſt of Aleppo. E. Long. 34. 45. N. Lat. 34. 54.

NICOT (John), lord of Villemain, and maſter of requeſts of the French king's houſehold, was born at Niſmes, and was ſent ambaſſador to Portugal in 1559; whence he brought the plant which, from his name, was called *Nicotiana*, but is now more generally known by the name of *Tobacco*. He died at Paris in 1603. He wrote a French and Latin dictionary in folio: a treatiſe on navigation; and other works.

NICOTIANA, TOBACCO, in botany: a genus of the monogynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 28th order, *Luridæ*. The corolla is funnel-ſhaped, with a plaited limb; the ſtamina inclined; the capſule bivalved and bilocular. There are ſeven ſpecies, of which the moſt remarkable is the *tabaccum*, or common tobacco plant. This was firſt diſcovered in America by the Spaniards about the year 1560, and by them imported into Europe. It had been uſed by the inhabitants of America long before; and was called by thoſe of the iſlands *yoli*, and *petun* by the inhabitants of the continent. It was ſent into Spain from Tabaco, a province of Yucatan, where it was firſt diſcovered, and from whence it takes its common name. Sir Walter Raleigh is generally ſaid to have been the firſt that introduced it into England about the year 1585, and who taught his countrymen how to ſmoke it. Dr Cotton Mather, however, (in his Chriſtian Philoſopher) ſays, that in the above year one Mr Lane carried over ſome of it from Virginia, which was the firſt they had ever been ſeen in Europe. Tobacco is commonly uſed among the oriental nations, though it is uncertain by whom it was introduced among them. Conſiderable quantities of it are cultivated in the Levant, on the coaſts of Greece and the Archipelago, in Italy, and in the iſland of Malta.

There are two varieties of that ſpecies of nicotiana which is cultivated for common uſe, and which are diſtinguiſhed by the names of *Oronokoe*, and *ſweet-ſcented tobacco*. They differ from each other only in the figure of their leaves; thoſe of the former being longer and narrower than the latter. They are tall herbaceous plants, growing erect with fine foliage, and riſing with a ſtrong ſtem from ſix to nine feet high. The ſtalk near the root, is upward of an inch diameter, and ſurrounded with a kind of hairy or velvet clammy ſubſtance, of a yellowiſh green colour. The leaves are rather of a deeper green, and grow alternately at the diſtance of two or three inches from each other. They are oblong, of a ſpear-ſhaped oval, and ſimple; the largeſt about 20 inches long, but decreaſing in ſize as they aſcend, till they come to be only 10 inches long, and about half as broad. The face of the leaves is much corrugated, like thoſe of ſpinage when full ripe. Before they come to maturity, when they are about five or ſix inches long, the leaves are generally of a full green, and rather ſmooth; but as they increaſe in ſize, they become rougher, and acquire a yellowiſh caſt. The ſtem and branches are terminated by large bunches of flowers collected into cluſters, of a delicate red; the edges, when full blown, inclining to a pale purple. They continue in ſucceſſion till the end of the ſummer; when they are ſucceeded by ſeeds of a brown colour, and kidney ſhaped. Theſe are very ſmall, each capſule containing about 1000; and the whole produce of a ſingle plant is reckoned at about 350,000. The ſeeds ripen in the month of September.

Mr Carver informs us, that the Oronokoe, or, as it is called, the *long Virginian tobacco*, is the kind beſt ſuited for bearing the rigour of a northern climate, the ſtrength as well as the ſcent of the leaves being greater than that of the other. The *ſweet-ſcented* ſort flouriſhes moſt in a ſandy ſoil, and in a warm climate, where it greatly exceeds the former in the celerity of its growth; and is likewiſe, as its name intimates, much more mild and pleaſant.

Culture. Tobacco thrives beſt in a warm, kindly, rich ſoil, that is not ſubject to be overrun by weeds. In Virginia, the ſoil in which it thrives beſt is warm, light, and inclining to be ſandy; and therefore, if the plant is to be cultivated in Britain, it ought to be planted in a ſoil as nearly of the ſame kind as poſſible. Other kinds of ſoil might probably be brought to ſuit it, by a mixture of proper manure; but we muſt remember, that whatever manure is made uſe of, muſt be thoroughly incorporated with the ſoil. The beſt ſituation for a tobacco plantation is the ſouthern declivity of a hill rather gradual than abrupt, or a ſpot that is ſheltered from the north winds: but at the ſame time it is neceſſary that the plants enjoy a free air; for without that they will not proſper.

As tobacco is an annual plant, thoſe who intend to cultivate it ought to be as careful as poſſible in the choice of the ſeeds; in which, however, with all their care, they may be ſometimes deceived. The ſeeds are to be ſown about the middle of April, or rather ſooner in a forward ſeaſon, in a bed prepared for this purpoſe of ſuch ſoil as has been already deſcribed, mixed with ſome warm rich manure. In a cold ſpring, hot beds are moſt eligible for this purpoſe, and gardeners imagine that they are always neceſſary: but Mr Carver tells us, that he is convinced, when the weather is not very ſevere, the tobacco ſeeds may be raiſed without doors; and for this purpoſe gives us the following directions.

Treatiſe on the Culture of Tobacco.

"Having ſown the ſeed in the manner above directed, on the leaſt apprehenſion of a froſt after the plants appear, it will be neceſſary to ſpread mats over the beds, a little elevated from the ground by poles laid acroſs, that they may not be cruſhed. Theſe, however, muſt be removed in the morning ſoon after the ſun appears, that they may receive as much benefit as poſſible from its warmth and from the air. In this manner proceed till the leaves have attained about two inches in length and one in breadth; which they will do in about a month after they are ſown, or near the middle of May, when the froſts are uſually at an end. One invariable rule for their being able to bear removal is, when the fourth leaf is ſprouted, and the fifth juſt appears. Then take the opportunity of the firſt rains or gentle ſhowers to tranſplant them into ſuch a ſoil and ſituation as before deſcribed; which muſt be done in the following manner.—The land muſt be ploughed, or dug up with ſpades, and made mellow and light as poſſible. When the plants are to be placed, raiſe with the hoe ſmall hillocks at the diſtance of two feet or a little more from each other, taking care that no hard ſods or lumps are in it; and then juſt indent the middle of each, without drilling holes, as for ſome other plants.

"When your ground is thus prepared, dig in a gentle manner from their native bed ſuch plants as have attained the proper growth for tranſplanting above-mentioned; and drop, as you paſs, one on every hillock. Inſert a plant gently into each centre, preſſing the ſoil around gently with your fingers; and taking the greateſt care, during the operation, that you do not break off any of the leaves, which are at this time exquiſitely tender. If the weather proves dry after they are thus tranſplanted, they muſt be watered with ſoft water, in the ſame manner as is uſually done to coleworts, or plants of a ſimilar kind. But though you now ſeem to have a ſufficient quantity of plants for the ſpace you intend to cultivate, it is yet neceſſary that you continue to attend to your bed of ſeedlings, that you may have enough to ſupply any deficiencies which through accident may ariſe. From this time great care muſt be taken to keep the ground ſoft and free from weeds, by often ſtirring with your hoe the mould round the roots; and to prune off the dead leaves that ſometimes are found near the bottom of the ſtalk.

"The difference of this climate from that in which I have been accuſtomed to obſerve the progreſs of this plant, will not permit me to direct with certainty the time which is moſt proper to take off the top of it, to prevent it from running to ſeed. This knowledge can only be acquired by experience. When it has riſen to the height of more than two feet, it commonly begins to put forth the branches on which the flowers and ſeeds are produced; but as this expanſion, if ſuffered to take place, would drain the nutriment from the leaves, which are the moſt valuable part, and thereby leſſen their ſize and efficacy, it becomes needful at this ſtage to nip off the extremity of the ſtalk to prevent its growing higher. In ſome other climates, the top is commonly cut off when the plant has 15 leaves; but if the tobacco is intended to be a little ſtronger than uſual, this is done when it has only 13; and ſometimes, when it is deſigned to be remarkably powerful, 11 or 12 are only allowed to expand. On the contrary, if the planter is deſirous of having his crop very mild, he ſuffers it to put forth 18 or 20: but in this calculation, the three or four lower leaves next the ground, which do not grow ſo large and fine as the others, are not be reckoned.

"This operation, denominated *topping* the tobacco, is much better performed by the finger and thumb than with any inſtrument; becauſe the graſp of the fingers cloſes the pores of the plant; whereas, when it is done by inſtruments, the juices are in ſome degree exhauſted. Care muſt alſo be taken to nip off the ſprouts that will be continually ſpringing up at the junction of the leaves with the ſtalks. This is termed *ſuccouring*, or *ſuckering*, the tobacco; and ought to be repeated as often as occaſion requires.

"As it is impoſſible to aſcertain the due time for topping the plant, ſo it is equally impoſſible, without experiment, to aſcertain the time it will take to ripen in this country. The apparent ſigns of its maturity are theſe: The leaves, as they approach a ſtate of ripeneſs, become more corrugated or rough; and when fully ripe, appear mottled with yellowiſh ſpots on the raiſed parts; whilſt the cavities retain their uſual green colour. They are at this time alſo thicker than they have before been; and are covered with a downy velvet, like that formerly mentioned, on the ſtalks. If heavy rains happen at this critical period, they will waſh off this excreſcent ſubſtance, and thereby damage the plants. In this caſe, if the froſty nights are not begun, it is proper to let them ſtand a few days longer; when, if the weather be moderate, they will recover this ſubſtance again. But if a froſt unexpectedly happens during the night, they muſt be carefully examined in the morning, before the ſun has any influence upon them; and thoſe which are found to be covered with froſty particles, whether thoroughly ripe or not, muſt be cut up; for though they may not all appear to be arrived at a ſtate of maturity, yet they cannot be far from it, and will differ but little in goodneſs from thoſe that are perfectly ſo."

Tobacco is ſubject to be deſtroyed by a worm; and without proper care to exterminate this enemy, a whole field of plants may ſoon be loſt. This animal is of the horned ſpecies, and appears to be peculiar to the tobacco plant; ſo that in many parts of America it is diſtinguiſhed by the name of the *tobacco worm*. In what manner it is firſt produced, or how propagated, is unknown; but it is not diſcernible till the plants have attained about half their height; and then appears to be nearly as large as a gnat. Soon after this it lengthens into a worm; and by degrees increaſes in magnitude to the bigneſs of a man's finger. In ſhape it is regular from its head to its tail, without any diminution at either extremity. It is indented or ribbed round at equal diſtances, nearly a quarter of an inch from each other; and having at every one of theſe diviſions a pair of feet or claws, by which it faſtens itſelf to the plant. Its mouth, like that of the caterpillar, is placed under the fore part of the head. On the top of the head, between the eyes, grows a horn about half an inch long, and greatly reſembling a thorn; the extreme part of which is of a brown colour, a firm texture, and the extremity ſharp pointed. It is eaſily cruſhed; being only, to appearance, a collection of green juice encloſed in a membraneous covering, without the internal parts of an animated being. The colour of its ſkin is in general green, interſperſed with ſeveral ſpots of a yellowiſh white; and the whole covered with a ſhort hair ſcarcely to be diſcerned. Theſe worms are found the moſt predominant during the latter end of July and the beginning of Auguſt; at which time the plants muſt be particularly attended to, and every leaf carefully ſearched. As ſoon as a wound is diſcovered, and it will not be long before it is perceptible, care muſt be taken to deſtroy the cauſe of it, which will be found near it, and from its unſubſtantial texture may eaſily be cruſhed: but the beſt method is to pull it away by the horn, and then cruſh it.

When the tobacco is fit for being gathered, as will appear from an attention to the foregoing directions, on the firſt morning that promiſes a fair day, before the ſun is riſen, take an axe or a long knife, and holding the ſtalk near the top with one hand, ſever it from its root with the other, as low as poſſible. Lay it gently on the ground, taking care not to break off the leaves, and there let it remain expoſed to the rays of the ſun throughout the day, or until the leaves, according to the American expreſſion, are entirely cured; that is, till they become limber, and will bend any way without breaking. But if the weather ſhould prove rainy without any intervals of ſunſhine, and the plants appear to be fully ripe, they muſt be houſed immediately. This muſt be done, however, with great care, that the leaves, which are in this ſtate very brittle, may not be broken. They are next to be placed under proper ſhelter, either in a barn or covered hovel, where they cannot be affected by rain or too much air, thinly ſcattered on the floor; and if the ſun does not appear for ſeveral days, they muſt be left to wilt in that manner; but in this caſe the quality of the tobacco will not be quite ſo good.

When the leaves have acquired the above-mentioned flexibility, the plants muſt be laid in heaps, or rather in one heap if the quantity is not too great, and in about 24 hours they will be found to ſweat. But during this time, when they have lain for a little while, and begin to ferment, it will be neceſſary to turn them;

Nicotiana.

them; bringing thoſe which are in the middle to the ſurface, and placing thoſe which are at the ſurface in the middle. The longer they lie in this ſituation, the darker coloured is the tobacco; and this is termed *ſweating* the tobacco. After they have lain in this manner for three or four days, (for a longer continuance might make the plants turn mouldy,) they may be faſtened together in pairs with cords or wooden pegs, near the bottom of the ſtalk, and hung acroſs a pole, with the leaves ſuſpended in the ſame covered place, a proper interval being left between each pair. In about a month the leaves will be thoroughly dried, and of a proper temperature to be taken down. This ſtate may be aſcertained by their appearing of the ſame colour with thoſe imported from America. But this can be done only in wet weather.—The tobacco is exceedingly apt to attract the humidity of the atmoſphere, which gives it a pliability that is abſolutely neceſſary for its preſervation; for if the plants are removed in a very dry ſeaſon, the external parts of the leaves will crumble into duſt, and a conſiderable waſte will enſue.

Cure. As ſoon as the plants are taken down, they muſt again be laid in a heap, and preſſed with heavy logs of wood for about a week; but this climate may poſſibly require a longer time.* While they remain in this ſtate, it will be neceſſary to introduce your hand frequently into the heap, to diſcover whether the heat be not too intenſe; for in large quantities this will ſometimes be the caſe, and conſiderable damage will be occaſioned by it. When they are found to heat too much, that is, when the heat exceeds a moderate glowing warmth, part of the weight by which they are preſſed muſt be taken away; and the cauſe being removed, the effect will ceaſe. This is called the *ſecond* or *laſt ſweating*; and, when completed, which it generally will be about the time juſt mentioned, the leaves muſt be ſtripped from the ſtalks for uſe. Many omit this laſt ſweating; but Mr Carver thinks that it takes away any remaining harſhneſs, and renders the tobacco more mellow. The ſtrength of the ſtalk alſo is diffuſed by it through the leaves, and the whole maſs becomes equally meliorated.—When the leaves are ſtripped from the ſtalks, they are to be tied up in bunches or *hands*, and kept in a cellar or other damp place; though if not handled in dry weather, but only during a rainy ſeaſon, it is of little conſequence in what part of the houſe or barn they are laid up. At this period the tobacco is thoroughly cured, and as proper for manufacturing as that imported from the colonies.

Our author adviſes the tobacco planter, in his firſt trials, not to be too avaricious, but to top his plants before they have gained their utmoſt height: leaving only about the middle quantity of leaves directed before to give it a tolerable degree of ſtrength. For though this, if exceſſive, might be abated during the cure by an increaſe of ſweating, or be remedied the next ſeaſon by ſuffering more leaves to grow, it can never be added; and, without a certain degree of ſtrength, the tobacco will always be taſteleſs and of little value. On the contrary, though it be ever ſo much weakened by ſweating, and thereby rendered mild, yet it will never loſe the aromatic flavour, which accompanied that ſtrength, and which greatly adds to its value. A ſquare yard of land, he tells us, will rear about 500 plants, and allow proper ſpace for their nurture till they are fit for tranſplanting.

Nicotiana.

The following extract, which is copied from a manuſcript of Dr Barham (A), for directing the raiſing, cultivating, and curing tobacco in Jamaica, is perhaps worthy of the attention of thoſe who wiſh to be further acquainted with this ſubject.

"Let the ground or woodland wherein you intend planting tobacco be well burned, as the greater the quantity of wood aſhes the better. The ſpot you intend raiſing your plants on muſt be well ſtrewed with aſhes, laid ſmooth and light: then blow the ſeed from the palm of your hand gently on the bed, and cover it over with palm or plantain leaves.

"When your plants are about four inches high, draw them and plant them out about three feet aſunder; and when they become as high as your knee, cut or pluck off the top; and if there are more than 12 leaves on the plant, take off the overplus, and leave the reſt entire.

"The plant ſhould now be daily attended to in order to deſtroy the caterpillars that are liable to infeſt it; as alſo to take off every ſprout or ſucker that puts out at the joints, in order to throw the whole vegetable nouriſhment into the large leaves.

"When the edges and points of the leaves begin to turn a little yellow, cut down the ſtalks about ten o'clock in the morning, taking the opportunity of a fine day, and be careful the dew is fully off the plant, and do not continue this work after two in the afternoon. As faſt as it is cut let it be carried into your tobacco houſe, which muſt be ſo cloſe as to ſhut out all air, (on this much depends), and hung up on lines tied acroſs, for the purpoſe of drying.

"When the ſtalks begin to turn browniſh, take them off the lines, and put them in a large binn, and lay on them heavy weights for 12 days; then take them out, and ſtrip off the leaves, and put them again into the binn, and let them be well preſſed, and ſo as no air gains admiſſion for a month. Take them out; tie them in bundles about 60 leaves in each, which are called *monococs*; and are ready for ſale. But obſerve to let them always be kept cloſe till you have occaſion to diſpoſe of them.

"Let your curing houſe be well built, and very cloſe and warm; if a boarded building, it will not be amiſs, in a wet ſituation, to cover the whole outſide with thatch and plantain traſh, to keep off the damps; for by this care you preſerve the fine volatile oil in the leaves. Obſerve, no ſmoke is to be made uſe of or admitted into your curing houſe.

Uſe. Since the introduction of tobacco into Europe 1560, various medical properties have been aſcribed to it at different times by Stahl and other German phyſicians;

(A) This gentleman was cotemporary with Sir Hans Sloane. He was a man of great probity, an able phyſician, and a ſkilful naturaliſt. He collected and arranged a number of the plants of Jamaica, which he preſented to Dr Sloane, and made ſeveral communications to the Royal Society.

cians; but the manner in which of late years it has been ſpoken of by the generality of writers on materia medica, has occaſioned it to be almoſt wholly diſmiſſed from modern practice, at leaſt from internal uſe; but this circumſtance has not deterred Dr Fowler, a phyſician of eminence in Staffordſhire, from commencing an inquiry into its medicinal effects; and he has given the reſult of his experiments, which ſeem to be accurately and faithfully related.

That tobacco, under proper regulations, may be adminiſtered internally, not only as a ſafe but as an efficacious remedy, eſpecially as a diuretic, in caſes of dropſy and dyſury, ſeems certain enough. This property, amongſt the vaſt number that have been attributed to it, however, ſeems ſcarcely ever to have been hinted at.

The forms in which Dr Fowler ordered it were either in infuſion, tincture, or pills.

Take of tobacco leaves dried, an ounce; boiling water, one pound: infuſe them for an hour in a cloſe veſſel ſet in a warm place, and ſtrain off about 14 ounces. Then add two ounces of rectified ſpirit of wine.

Take of dried tobacco leaves, an ounce; of rectified ſpirits; Spaniſh white wine, or vinegar, one pint: to be infuſed for four days.

Take of dried tobacco leaves in powder, one drachm; of the conſerve of roſes, enough to make it in a maſs; which is to be divided into 60 pills.

Of the infuſion, or tincture, Dr Fowler gives from ſix to 100 drops twice a day in water, or in a cordial julep, or other proper vehicle, ſufficient to produce the effect in adults; but in irritable habits he ſeldom exceeded 25 drops. To a patient of 10 years old he gave 50 drops; to a child of five years old 20 drops; but to patients under five years old he never ventured to preſcribe it.

The firſt effects of the infuſion is a tranſient heat in the ſtomach and throat, as if the patient had taken a dram. The next general effect in a moderate doſe is diuretic, with or without a ſlight vertigo and giddineſs, and frequently nauſea. In painful caſes, it proves anodyne, and in ſome caſes occaſions drowſineſs and ſleep; in others drowſineſs, with a ſenſe of heat and reſtleſſneſs.

Dr Fowler gave this medicine in 115 caſes: in 93 of which it proved diuretic; in 40 of theſe caſes it occaſioned purging; 79 of theſe patients complained of vertigo. In 52 of the number it excited nauſea; in the two laſt caſes he directs the medicine to be ſuſpended, and the doſes leſſened. Dr Fowler tried it in 30 caſes of dropſy, viz. four of anaſarca, or general dropſy; two of aſcites; and 12 of dropſical ſwellings of the legs, were all cured. In ten other caſes it afforded conſiderable relief; and in three caſes only it was of no uſe. In ten inſtances of dyſury, the infuſion was anodyne and diuretic, thereby abating pain, relaxing the urinary paſſages, and promoting urine.—In dyſuries from gravel, it facilitates the expulſion of calcareous or gritty matter.

Dr Fowler ſpeaks of the uſe of tobacco in injections; an ounce of the infuſion in a pint of water-gruel at a time, and repeated in caſes of obſtinate conſtipation, as the caſe may require. In the *dry bellyach*, in the Weſt Indies, injections of the ſmoke of tobacco have long been employed with the happieſt effects.

After all, the internal uſe of tobacco ſhould be very limited, and can only be ſafe in the hands of a ſkilful and attentive practitioner. Tobacco is ſometimes uſed externally in unguents for deſtroying cutaneous inſects, cleanſing old ulcers, &c. Beaten into a maſh with vinegar or brandy, it has ſometimes proved ſerviceable for removing hard tumours of the hypochondres. An account is given in the Edinburgh Eſſays of two caſes of this kind cured by it. The moſt common uſes of this plant, however, are either as a ſternutatory when taken by way of ſnuff, as a maſticatory by chewing it in the mouth, or as effluvia by ſmoking it; and when taken in moderation, it is not an unhealthful amuſement. Before pipes were invented, it was uſually ſmoked in ſegars, and they are ſtill in uſe among ſome of the ſouthern nations. The method of preparing theſe is at once ſimple and expeditious. A leaf of tobacco being formed into a ſmall twiſted roll, ſomewhat larger than the ſtem of a pipe, and about eight inches long, the ſmoke is conveyed through the winding folds which prevent it from expanding, as through a tube; ſo that one end of it being lighted, and the other applied to the mouth, it is in this form uſed without much inconvenience. But, in proceſs of time, pipes being invented, they were found more commodious vehicles for the ſmoke, and are now in general uſe.

Among all the productions of foreign climes introduced into theſe kingdoms, ſcarce any has been held in higher eſtimation by perſons of every rank than tobacco. In the countries of which it is a native, it is conſidered by the Indians as the moſt valuable offering that can be made to the beings they worſhip. They uſe it in all their civil and religious ceremonies. When once the ſpiral wreaths of its ſmoke aſcend from the feathered pipe of peace, the compact that has been juſt made is conſidered as ſacred and inviolable. Likewiſe, when they addreſs their great Father, or his guardian ſpirits, reſiding, as they believe, in every extraordinary production of nature, they make liberal offerings to them of this valuable plant, not doubting but that they are thus ſecured of protection.

Tobacco is made up into rolls by the inhabitants of the interior parts of America, by means of a machine called a *tobacco wheel*. With this machine they ſpin the leaves after they are cured, into a twiſt of any ſize they think fit; and having folded it into rolls of about 20 pounds each, they lay it by for uſe. In this ſtate it will keep for ſeveral years, and be continually improving, as it always grows milder. The Illinois uſually form it into carrots; which is done by laying a number of leaves, when cured, on each other after the ribs have been taken out, and rolling them round with packthread, till they become cemented together. Theſe rolls commonly meaſure about 18 or 20 inches in length, and nine round in the middle part.

Tobacco forms a very conſiderable article in commerce; for an account of which ſee the articles GLASGOW and VIRGINIA.

NICTITATING MEMBRANE, a thin membrane chiefly found in the bird and fiſh kind, which covers the eyes of theſe animals, ſheltering them from the duſt or too much light; yet is ſo thin and pellucid, that they can ſee pretty well through it.

NIDDUI, in the Jewiſh cuſtoms, is uſed to ſignify "ſeparated or excommunicated." This, according to ſome, was to be underſtood of the leſſer ſort of excommunication in uſe among the Hebrews. He that had incurred it was to withdraw himſelf from his relations, at leaſt to the diſtance of four cubits: it commonly continued a month. If it was not taken off in that time, it might be prolonged for 60 or even 90 days: but if, within this term, the excommunicated perſon did not give ſatisfaction, he fell into the cherem, which was a ſecond ſort of excommunication; and thence into the third ſort, called *ſhammata* or *ſhematta*, the moſt terrible of all. But Selden has proved that there were only two kinds of excommunication, *viz.* the greater and leſs; and that theſe three terms were uſed indifferently.

NIDUS, among naturaliſts, ſignifies a neſt or proper repoſitory for the eggs of birds, inſects, &c. where the young of theſe animals are hatching and nurſed.

NIDIFICATION, a term generally applied to the formation of a bird's neſt, and its hatching or bringing forth its young. See ORNITHOLOGY.

NIECE, a brother's or ſiſter's daughter, which in the civil law is reckoned the third degree of conſanguinity.

NIEMEN, a large river of Poland, which riſes in Lithuania, where it paſſes by Bielica, Grodno, and Konno: it afterwards runs through part of Samogitia and Ducal Pruſſia, where it falls into the lake called the *Curiſch-haff*, by ſeveral mouths, of which the moſt northern is called the *Ruſs*, being the name of a town it paſſes by.

NIENBURGH, a rich and ſtrong town of Germany, in the duchy of Brunſwic-Lunenburg, with a ſtrong caſtle. It carries on a conſiderable trade in corn and wool, and is ſeated in a fertile ſoil on the river Weſer. E. Long. 9. 26. N. Lat. 52. 44.

NIEPER, a large river of Europe, and one of the moſt conſiderable of the North, formerly called the Boriſthenes. Its ſource is in the middle of Muſcovy, running weſt by Smolenſko, as far as Orſa; and then turns ſouth, paſſing by Mohilow, Bohaczo, Kiow, Czyrkaſſy, the fortreſs of Kudak, Deſſau, and Oczakow, falling into the Black ſea; as alſo in its courſe it divides Little Tartary fom Budziac Tartary.

NIESS, a mountain in the environs of Berne in Switzerland. It is the laſt mountain in a high calcareous chain of hills, of which the Stockhorn, the Neuneren, and the Ganteriſh, have been illuſtrated by the botanical labours of the celebrated Haller. Nieſs ſtands on the borders of the lake Thun, and ſeparates the valley of Frutingen from that of Simme. It is very intereſting to the curious traveller, on account of the fine view from its top; and to naturaliſts, becauſe it joins the Alps. Towards its foot, beds of ſlate have been diſcovered; it is of calcareous ſtone higher up; and near its top is found a ſpecies of puddingſtone, filled with ſmall fragments of broken petrifactions.

NIESTER, a large river of Poland, which has its ſource in the Lake Nieſter, in the palatinate of Lemburg, where it paſſes by Halicz. Then it ſeparates Podolia and Oczakow Tartary from Moldavia and Budziac Tartary; and falls into the Black ſea at Belgorod, between the mouths of the Nieper and the Danube.

NIEUHOFF (John de), a Dutch author, was born about the beginning of the laſt century. We are indebted to him for a valuable and curious account, written in Dutch, of his embaſſy from the Dutch Eaſt India Company to the emperor of China. Jean le Carpentier publiſhed an excellent tranſlation of it into French, in folio, Leyden, 1665. This edition is rare, and the book is in great requeſt.

NIEUWENTYT (Bernard), an able philoſopher and learned mathematician, was born at Weſtgraaſdyk, in the year 1654, and became counſellor and burgomaſter of the town of Purmerend, where he was eſteemed for his integrity and learning, and died in 1718. He wrote, in Dutch, 1. An excellent treatiſe, entitled, The Exiſtence of God demonſtrated by the Works of Nature. 2. A Refutation of Spinoza. 3. Some Pieces againſt the Infiniteſimals, &c.

NIGELLA, FENNEL-FLOWER, or *Devil in a Buſh*: A genus of the pentagynia order, belonging to the pentandria claſs of plants. There is no calyx; the petals are five; and five trifid nectaria within the corolla; there are five connected capſules. There are five ſpecies, all of them natives of the warm parts of Europe, and riſing from a foot to a foot and a half high, adorned with blue or yellow flowers. They are propagated by ſeeds, which in a dry and warm ſituation will thrive very well; and the plants ripen ſeeds in this country.

NIGER (C. Peſcennius Juſtus), a celebrated governor in Syria, well known by his valour in the Roman armies while but a private man. At the death of Pertinax he was declared emperor of Rome; and his claims to that elevated ſtation were ſupported by a ſound underſtanding, prudence of mind, moderation, courage, and virtue. He propoſed to imitate the actions of the venerable Antoninus, of Trajan, of Titus, and M. Aurelius. He was remarkable for his fondneſs of ancient diſcipline. He never ſuffered his ſoldiers to drink wine, but obliged them when thirſty to uſe water and vinegar. He forbade the uſe of ſilver or gold utenſils in his camp. All the bakers and cooks were driven away, and the ſoldiers were ordered to live during the expedition they undertook merely upon biſcuits. In his puniſhments Niger was inexorable: he condemned ten of his ſoldiers to be beheaded in the preſence of the army becauſe they had ſtolen and eaten a fowl. The ſentence was heard with groans. The army interfered; and when Niger conſented to diminiſh the puniſhment, for fear of kindling rebellion, he yet ordered the criminals to make each a reſtoration of ten fowls to the perſon whoſe property they had ſtolen. They were beſides ordered not to light a fire the reſt of the campaign, but to live upon cold aliments and to drink nothing but water. Such great qualifications in a general ſeemed to promiſe the reſtoration of ancient diſcipline in the Roman armies; but the death of Niger fruſtrated every hope of reform. Severus, who had alſo been inveſted with the imperial purple, marched againſt him: ſome battles were fought, and Niger was at laſt defeated, A. D. 195. His head was cut off and fixed to a long ſpear, and carried in triumph through the ſtreets of Rome. He reigned about a year.

Niger, a great river of Africa, ſuppoſed to have its origin near that of the Nile; but this is very uncertain. We are aſſured, however, that it is a river of very great extent: eſpecially if we ſuppoſe, according to the opinion of the beſt modern geographers, that it has its ſource in the kingdom of Gorhan, not far from the confines of Upper Ethiopia; for then it will croſs almoſt the whole continent of Africa, where it is wideſt. In its courſe it receives many conſiderable rivers, which ſwell it high enough to be able at all times to carry veſſels of good burden; it ſplits itſelf into ſeveral branches, which uniting again form very large and fertile iſlands, well filled with towns and villages. It paſſes alſo through ſeveral lakes, and has many cataracts. After having run from eaſt to weſt during a prodigious long courſe, it turns at laſt ſhort to the ſouth, at a league and a half diſtance from the weſtern ocean; leaving but a very narrow tract between it and the ſea, into which it opens its way in lat. 15. 55. after having run about 25 leagues from north to ſouth. Its mouth is ſometimes half a league broad; but is ſhut up by a bank of quick ſand, called the *bar of Senegal*, where the water is ſo ſhallow, that it is very difficult and dangerous to paſs over it. The bar is formed by the mud and ſand which the river brings with it during the inundation, and which the ſea continually drives back upon the ſhore. This would effectually exclude all ſhipping, had not the violence of the current, and the weight of the waters, made two openings or channels, which are commonly called the *paſſes of the bar*. The largeſt of theſe is generally not above 150 or 200 fathoms broad, and about 10 feet deep, ſo that none but barks of 40 or 50 tons can get through this channel; the other is ſo narrow and ſhallow, that it is paſſable by canoes only. Theſe channels are not always in the ſame place; for the river, as it is more or leſs ſwelled, or the current more or leſs rapid, open thoſe paſſes ſometimes in one place and ſometimes in another. The bar itſelf alſo frequently ſhifts its place; ſo that the iſland of Senegal is ſometimes four leagues diſtant from it, at other times only two. It is this bar only which hinders ſhips of 400 or 500 tons to go up the river. See Guinea and Negroland.

NIGHT, that part of the natural day during which the ſun is underneath the horizon; or that ſpace wherein it is duſky.

Night was originally divided by the Hebrews and other eaſtern nations into three parts or watches. The Romans, and after them the Jews, divided the night into four parts or watches; the firſt of which began at ſunſet, and laſted till nine at night, according to our way of reckoning; the ſecond laſted till midnight; the third till three in the morning; and the fourth ended at ſunriſe. The ancient Gauls and Germans divided their time not by days but by nights; and the people of Iceland and the Arabs do the ſame at this day. The like is obſerved of the Anglo-Saxons.—The length and ſhortneſs of night or of darkneſs is according to the ſeaſon of the year and poſition of the place; and the cauſes of this variety are now well known. See Astronomy, &c.

Night, in ſcripture language, is uſed for the times of heatheniſh ignorance and profaneneſs (Rom. xiii. 12.); for adverſity and affliction (Iſ. xxi. 12.); and, laſtly, for death (John ix. 4.)

Night-Angling, a method of catching large and ſhy fiſh is the night time. Trout, and many other of the better ſorts of fiſh, are naturally ſhy and fearful; they therefore prey in the night as the ſecureſt time.—The method of taking them on this plan is as follows: The tackle muſt be ſtrong, and need not be ſo fine as for day fiſhing, when every thing is ſeen; the hook muſt be baited with a large earth worm, or a black ſnail, and thrown out into the river; there muſt be no lead to the line, ſo that the bait may not ſink, but be kept drawling along, upon or near the ſurface. Whatever trout is near the place will be brought thither by the motion of the water, and will ſeize the worm or ſnail. The angler will be alarmed by the noiſe which the fiſh makes in riſing, and muſt give him line, and time to ſwallow the hook; then a ſlight touch ſecures him. The beſt and largeſt trouts are found to bite thus in the night; and they riſe moſtly in the ſtill and clear deeps, not in the ſwift and ſhallow currents. Sometimes, though there are fiſh about the place, they will not riſe at the bait: in this caſe the angler muſt put on ſome lead to his line, and ſink it to the bottom.

Night-Mare, or *Incubus*. See Medicine, N° 329.

Night-Walkers, in medicine. See Medicine, N° 329, and Noctambuli.

Night-Walkers, in law, are ſuch perſons as ſleep by day and walk by night, being oftentimes pilferers or diſturbers of the public peace. Conſtables are authorized by the common law to arreſt night-walkers and ſuſpicious perſons, &c. Watchmen may alſo arreſt night-walkers, and hold them until the morning: and it is ſaid, that a private perſon may arreſt any ſuſpicious night-walker, and detain him till he give a good account of himſelf. One may be bound to the good behaviour for being a night-walker; and common night-walkers, or haunters of bawdy-houſes, are to be indicted before juſtices of peace, &c. But it is not held lawful for a conſtable, &c. to take up any woman as a night-walker on bare ſuſpicion only of being of ill fame, unleſs ſhe be guilty of a breach of the peace, or ſome unlawful act, and ought to be found miſdoing.

NIGHTINGALE, in ornithology; a ſpecies of motacilla. See Motacilla, and Plate CCCXV.

The nightingale takes its name from *night*, and the Saxon word *galan*, "to ſing;" expreſſive of the time of its melody. Its ſize and colour has been deſcribed already under Motacilla: to which account we add, that its eyes are remarkably large and piercing; and though it is about equal in ſize to the redſtart, it is longer in body, and more elegantly made.

Mr Hunter found, by diſſection, that the muſcles of the larynx are ſtronger in the nightingale than in any other bird of the ſame ſize.—Sibbald places them in his liſt of Scotch birds; but they certainly are unknown in that part of Great Britain, probably from the ſcarcity and the recent introduction of hedges there. Yet they viſit Sweden, a much more ſevere climate. In England they frequent thick hedges, and low coppices; and generally keep in the middle of the buſh, ſo that they are very rarely ſeen. When the young ones firſt come abroad, and are helpleſs, the old birds make a plaintive and jarring noiſe with a ſort

Nightingale.

of ſnapping as if in menace, purſuing along the hedge the paſſengers.

They begin their ſong in the evening, and continue it the whole night. Theſe their vigils did not paſs unnoticed by the ancients: the ſlumbers of theſe birds were proverbial; and not to reſt as much as the nightingale, expreſſed a very bad ſleeper (A). This was the favourite bird of the Britiſh poet, who omits no opportunity of introducing it, and almoſt conſtantly noting its love of ſolitude and night. How finely does it ſerve to compoſe part of the ſolemn ſcenery of his *Penſeroſo*; when he deſcribes it

> In her ſaddeſt ſweeteſt plight,
> Smoothing the rugged brow of night;
> While *Cynthia* checks her dragon yoke,
> Gently o'er th' accuſtom'd oak.
> Sweet bird, that ſhunn'ſt the noiſe of folly,
> Moſt muſical, moſt melancholy!
> Thee, chauntreſs, oft' the woods among,
> I woo to hear thy evening ſong.

In another place he ſtyles it the *ſolemn bird*; and again ſpeaks of it,

> As the wakeful bird
> Sings darkling, and, in ſhadieſt covert hid,
> Tunes her nocturnal note.

The reader will excuſe a few more quotations from the ſame poet, on the ſame ſubject; the firſt deſcribes the approach of evening, and the retiring of all animals to their repoſe.

> Silence accompanied; for beaſt and bird,
> They to their graſſy couch, theſe to their neſts,
> Were ſlunk; all but the wakeful *nightingale*,
> She all night long her am'rous deſcant ſung.

When Eve paſſed the irkſome night preceding her fall, ſhe, in a dream, imagines herſelf thus reproached with loſing the beauties of the night by indulging too long a repoſe.

> Why ſleep'ſt thou, *Eve?* now is the pleaſant time,
> The cool, the ſilent, ſave where ſilence yields
> To the night warbling bird, that now awake
> Tunes ſweeteſt his love labour'd ſong.

The ſame birds ſing their nuptial ſong, and lull them to reſt. How rapturous are the following lines! how expreſſive of the delicate ſenſibility of our Milton's tender ideas?

> The earth
> Gave ſign of gratulation, and each hill;
> Joyous the birds; freſh gales and gentle airs
> Whiſper'd it to the woods, and from their wings
> Flung roſe, flung odours from the ſpicy ſhrub,
> Diſporting, till the am'rous bird of night
> Sung ſpouſal, and bid haſte the evening ſtar
> On his hill top to light the bridal lamp.
> Theſe, lull'd by *nightingales*, embracing ſlept;
> And on their naked limbs the flow'ry roof
> Shower'd roſes, which the morn repair'd.

Nightingale

Theſe quotations from the beſt judge of melody, we thought due to the ſweeteſt of our feathered chooriſters; and we believe no reader of taſte will think them tedious.

Virgil ſeems to be the only poet among the ancients who hath attended to the circumſtance of this bird's ſinging in the night time.

> *Qualis populeâ mærens* Philomela *ſub umbrâ*
> *Amiſſos queritur fœtus, quos durus arator*
> *Obſervans nido implumes detraxit: at illa*
> *Flet noctem, ramoque ſedens miſerabile carmen*
> *Integrat, et mæſtis late loca queſtibus implet.*
> Georg. IV. l. 511.

> As *Philomel* in poplar ſhades, alone,
> For her loſt offspring pours a mother's moan,
> Which ſome rough ploughman marking for his prey,
> From the warm neſt, unfledg'd, hath dragg'd away;
> Perch'd on a bough, ſhe all night long complains,
> And fills the grove with ſad repeated ſtrains.
> *F. Warton.*

Pliny has deſcribed the warbling notes of this bird with an elegance that beſpeaks an exquiſite ſenſibility of taſte. Lib. X. c. 29.

If the nightingale is kept in a cage, it often begins to ſing about the latter end of November, and continues its ſong more or leſs till June.—A young Canary bird, linnet, ſky lark, or robin (who have never heard any other bird), are ſaid beſt to learn the note of a nightingale.

Mock NIGHTINGALE. See MOTACILLA, ſp. 8.

Virginian NIGHTINGALE, in ornithology, the common, but improper, name of a bird of the groſs-beaked kind, called by authors the *coccothrauſtes Indica criſtata*.

It is a little ſmaller than our blackbird; it has a black ring ſurrounding the eyes and noſtrils; the beak is very large and thick, but not altogether ſo large as in the common groſs-beak; and its head is ornamented with a very high and beautiful creſt, which it moves about very frequently; it is all over of a very fine and lively red, but paler on the head and tail than elſewhere; it is brought to us from Virginia, and is much valued in England for its beauty and delicate manner of ſinging; it is very fond of almonds and the like fruits.

NIGHTSHADE, in botany. See SOLANUM.

Deadly NIGHTSHADE. See ATROPA.—The berries of this plant are of a malignant poiſonous nature; and, being of a ſweet taſte, have frequently proved deſtructive to children. A large glaſs of warm vinegar, taken as ſoon as poſſible after eating the berries, will prevent their bad effects.

Nigidius.

NIGIDIUS FIGULUS (Publius), one of the moſt learned men of ancient Rome, flouriſhed at the ſame time with Cicero. He wrote on various ſubjects; but his pieces appeared ſo refined and difficult that they were not regarded. He aſſiſted Cicero, with great prudence, in defeating Catiline's conſpiracy, and did him many ſervices in the time of his adverſity. He

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(A) *Ælian var. hiſt.* 577. both in the text and note. It muſt be remarked, that nightingales ſing alſo in the day.

adhered to Pompey in oppoſition to Cæſar; which occaſioned his exile, he dying in baniſhment. Cicero, who had always entertained the higheſt eſteem for him, wrote a beautiful conſolatary letter to him (the 13th of *Lib.* IV. *ad Familiares.*)

NIGRINA, in botany; a genus of the monogynia order, belonging to the petandria claſs of plants. The corolla is funel-ſhaped; the calyx inflated; the ſtigma obtuſe; the capſule bilocular.

NIGRITIA. See NEGROLAND.

NIGUA. See CHEGOE.

NILE, a large and celebrated river of Africa, to which the country of Egypt owes its fertility; and the exploring the ſources of which has, from the remoteſt ages, been accounted an impracticable undertaking. Of late this problem has been ſolved by James Bruce, Eſq; of Kinnaird, in Scotland; who ſpent ſeveral years at the court of Abyſſinia, and by the favour of the emperor and great people of the country was enabled to accompliſh the arduous taſk.

In the account of his travels lately publiſhed, this gentleman has been at particular pains to ſhow, that none of thoſe who undertook this taſk ever ſucceeded in it but himſelf. The inquiry concerning its ſprings, he ſays, began either before hiſtory or tradition, and is by ſome ſuppoſed to be the origin of hieroglyphics. Though Egypt was the country which received the greateſt benefit from this river, it was not there that the inquiries concerning its inundation began: it being probable that every thing relative to the extent and periodical time of that inundation could be accurately ſettled (which could not be done but by a long ſeries of obſervations) before any perſon would venture to build houſes within its reach.

The philoſophers of Meroe, in our author's opinion, were the firſt who undertook to make a number of obſervations ſufficient to determine theſe points; their country being ſo ſituated, that they could perceive every thing relative to the increaſe or decreaſe of the river without any danger from its overflowing. Being much addicted to aſtronomy, it could not long eſcape them, that the heliacal riſing of the dog ſtar was a ſignal for Egypt to prepare for the inundation; without which it was vain to expect any crop. The conection of this celeſtial ſign with the annual riſing of the river would undoubtedly ſoon become a matter of curioſity; and as this could not eaſily be diſcovered, it was natural for an ignorant and ſuperſtitious people to aſcribe the whole to the action of the dog ſtar as a deity. Still however, by thoſe who were more enlightened, the phenomenon would be aſcribed to natural cauſes; and a great ſtep towards the diſcovery of theſe, undoubtedly was that of the ſources of the river itſelf. In the early ages, when travelling into foreign countries was impracticable by private perſons, the inquiry into the ſources of the Nile became an object to the greateſt monarchs. Seſoſtris is ſaid to have preferred the honour of diſcovering them almoſt to all the victories he obtained. Alexander the Great is well known to have had a great curioſity to diſcover theſe fountains. On his arrival at the temple of Jupiter Ammon, he is ſaid to have made inquiry concerning the fountains of the Nile, even before he aſked about his own deſcent from Jupiter. The prieſts are ſaid to have given him proper directions for finding them: and Alexander took the moſt ready means of accompliſhing his purpoſe, by employing natives of Ethiopia to make the ſearch. Theſe diſcoverers, in the opinion of Mr Bruce, miſſed their aim, by reaſon of the turn which the Nile takes to the eaſt in the latitude of 9° where it begins to ſurround the kingdom of Gojam; but which they might imagine to be only a winding of the river ſoon to be compenſated by an equal turn to the weſt. "They therefore (ſays he) continued their journey ſouth till near the line, and never ſaw it more; as they could have no poſſible notion it had turned back behind them, and that they had left it as far north as latitude 9°. They reported then to Alexander what was truth, that they had aſcended the Nile as far ſouth as latitude 9°; where it unexpectedly took its courſe to the eaſt, and was ſeen no more. The river was not known, nor to be heard of near the line, or farther ſouthward, nor was it diminiſhed in ſize, nor had it given any ſymptom that the were near its ſource; they had found the Nile *calentem* (warm), while they expected its riſe among melting ſnows.

Mr Bruce is of opinion that this turn of the Nile to the eaſtward was the occaſion of Alexander's extravagant miſtake, in ſuppoſing that he had diſcovered the fountains of the Nile when he was near the ſource of the Indus; and which he wrote to his mother, though he afterwards cauſed it to be eraſed from his books.

Ptolemy Philadelphus ſucceeded Alexander in his attempts to diſcover the ſource of the Nile; but he likewiſe proving unſucceſsful, the taſk was not undertaken by Ptolemy Euergetes, the moſt powerful of the Greek princes who ſat on the throne of Egypt. "In this (ſays Mr Bruce) he had probably ſucceeded, had he not miſtaken the river itſelf. He ſuppoſed the Siris, now the Tacazze, to be the Nile; and aſcending in the direction of its ſtream, he came to Axum, the capital of Sira and of Ethiopia. But the ſtory he tells of the ſnow which he found knee-deep on the mountains of Samen, makes me queſtion whether he ever croſſed the Siris, or was himſelf an ocular witneſs of what he ſays he obſerved there."

Cæſar had the ſame curioſity with other conquerors to viſit the ſprings of the Nile, though his ſituation did not allow him to make any attempt for that purpoſe. Nero, however, was more active. He ſent two centurions into Ethiopia, with orders to explore the unknown fountains of this river; but they returned without having accompliſhed their errand. They reported, that, after having gone a long way, they came to a king of Ethiopia, who furniſhed them with neceſſaries, and recommendations to ſome other kingdoms adjacent; paſſing which, they came to immenſe lakes, of which nobody knew the end, nor could they ever hope to find it. Their ſtory, however, is by Mr Bruce ſuppoſed to be a fiction; as the Nile forms no lakes throughout its courſe, excepting that of Tzana or Dembea, the limits of which are eaſily perceived.

No other attempt was made by the ancients to diſcover the ſources of this celebrated river; and the matter was looked upon to be an impoſſibility, inſomuch that *caput Nili quærere* became a proverb, denoting the impoſſibility of any undertaking. The firſt who, in more modern ages, made any attempt of this kind was a monk ſent into Abyſſinia in the year 522, by Nonnoſus, ambaſſador from the emperor Juſtin. This monk is called *Coſmas the Hermit*, and likewiſe *Indoplauſtes*, from his ſuppoſed travels into India. He proceeded as far as the city of Axum, but did not viſit that part of the country where the head of the Nile lies; nor, in Mr Bruce's opinion, would it have been practicable for him to do ſo. The diſcovery, however, is ſaid to have been made at laſt by Peter Paez the miſſionary. But the truth of this account is denied by Mr Bruce, for the following reaſons: 1. "No relation of this kind (ſays he) was to be found in three copies of Peter Paez's hiſtory, to which I had acceſs when in Italy, on my return home. One of theſe copies I ſaw at Milan; and, by the intereſt of friends, had an opportunity of peruſing it at my leiſure. The other two were at Bologna and Rome. I ran through them rapidly; attending only to the place where the deſcription ought to have been, and where I did not find it: but having copied the firſt and laſt page of the Milan manuſcript, and comparing them with the two laſt mentioned, I found that all the three were, word for word, the ſame, and none of them contained one ſyllable of the diſcovery of the ſource. 2. Alphonſo Mendez came into Abyſſinia about a year after Paez's death. New and deſirable as that diſcovery muſt have been to himſelf, to the pope, king of Spain, and all his great patrons in Portugal and Italy; though he wrote the hiſtory of the country, and of the particulars concerning the miſſion in great detail and with good judgment, yet he never mentions this journey of Peter Paez, though it probably muſt have been conveyed to Rome and Portugal after his inſpection and under his authority. 3. Balthazar Tellez, a learned Jeſuit, has wrote two volumes in folio, with great candour and impartiality, conſidering the ſpirit of thoſe times; and he declares his work to be compiled from thoſe of Alphonſo Mendez the patriarch, from the two volumes of Peter Paez, as well as from the regular reports made by the individuals of the company in ſome places, and by the provincial letters in others; to all which he had complete acceſs, as alſo to the annual reports of Peter Paez, among the reſt from 1598 to 1622; yet Tellez makes no mention of ſuch a diſcovery, though he is very particular as to the merit of each miſſionary during the long reign of Facilidas, which occupies more than half the two volumes."

The firſt, and indeed the only account of the fountains of the Nile, publiſhed before that of Mr Bruce, was Kircher's; who ſays that he took it from the writings of Peter Paez. The time when the diſcovery is ſaid to have been made was the 21ſt of April 1618; at which ſeaſon the rains are begun, and therefore very unwholeſome; ſo that the Abyſſinian armies are not without extreme neceſſity in the field; between September and February at fartheſt is the time they are abroad from the capital and in action.

"The river (ſays Kircher) at this day, by the Ethiopians, is called *Abavy*; it riſes in the kingdom of Gojam, in a territory called *Sabala*, whoſe inhabitants are called *Agows*. The ſource of the Nile is ſituated in the weſt part of Gojam, in the higheſt part of a valley, which reſembles a great plain on every ſide ſurrounded by high mountains. On the 21ſt of April 1618 being here, together with the king and his army, I aſcended the place, and obſerved every thing with great attention: I diſcovered firſt two round fountains each about four palms in diameter, and ſaw, with the greateſt delight, what neither Cyrus the Perſian, nor Cambyſes, nor Alexander the Great, nor the famous Julius Cæſar, could ever diſcover. The two openings of theſe fountains have no iſſue in the plain on the top of the mountain, but flow from the root it. The ſecond fountain lies about a ſtone-caſt weſt from the former: the inhabitants ſay that this whole mountain is full of water; and add, that the whole plain about the fountain is floating and unſteady, a certain mark that there is water concealed under it; for which reaſon the water does not overflow at the fountain, but forces itſelf with great violence out at the foot of the mountain. The inhabitants together with the emperor, who was then preſent with his army, maintain, that that year it trembled very little on account of the drought; but in other years, that it trembled and overflowed ſo that it could ſcarce be approached without danger. The breadth of the circumference may be about the caſt of a ſling: below the top of this mountain the people live about a league diſtant from the fountain to the weſt; and this place is called *Geeſh*; and the fountain ſeems to be about a cannon ſhot diſtant from Geeſh; moreover the field where the fountain is, is on all ſides difficult of acceſs, except on the north ſide, where it may be aſcended with eaſe."

On this relation Mr Bruce obſerves, that there is no ſuch place as *Sabala*; it ought to have been named *Sacala*, ſignifying the higheſt ridge of land, where the water falls equally down on both ſides, from eaſt and weſt, or from north and ſouth. So the ſharp roofs of our houſes, where the water runs down equally on the oppoſite ſides, are called by the ſame name. Other objections are drawn from the ſituation of places, and from the number and ſituation of the fountains themſelves, every one of which Mr Bruce found by actual menſuration to be different from Kircher's account. The following, however, he looks upon to be deciſive that Paez never was on the ſpot. "He ſays, the field in which the fountains of the Nile are, is of very difficult acceſs; the aſcent to it being very ſteep, excepting on the north, where it is plain and eaſy. Now, if we look at the beginning of this deſcription, we ſhould think it would be the deſcent, not the aſcent, that would be troubleſome; for the fountains were placed in a valley, and people rather *deſcend* into valleys than *aſcend* into them; but ſuppoſing it was a valley in which there was a field upon which there was a mountain, and on the mountain theſe fountains; ſtill, I ſay, that theſe mountains are nearly inacceſſible on the three ſides; but that the moſt difficult of them all is the north, the way we aſcend from the plain of Goutto. From the eaſt, by Sacala, the aſcent is made from the valley of Litchambara, and from the plain of Aſſoa to the ſouth you have the almoſt perpendicular craggy cliff of Geeſh, covered with thorny buſhes, trees, and bamboos, which cover the mouths of the caverns; and on the north you have the mountains of Aformaſha, thick ſet with all ſorts of thorny trees and ſhrubs, eſpecially with the kantuſſa: theſe thickets ar[illegible] over, filled with wild beaſts, eſpecially huge, long-haired baboons, which we frequently met walking upright. Through theſe high and difficult mountains we have only narrow paths, like thoſe of ſheep, made by the goats, or the wild beaſts we are ſpeaking of, which, after we had walked on them for a long ſpace, landed us frequently at the edge of ſome valley or precipice, and forced us to go back again to ſeek a new road. From towards Zeegam to the weſtward, and from the plain where the river winds ſo much, is the only eaſy acceſs to the fountains of the Nile: and they that aſcend to them by this way will not even think that approach too eaſy."

Peter Heiling, a Proteſtant of Lubec, reſided ſeveral years in the country of Gojam, and was even governor of it, but he never made any attempt to diſcover the ſource of the Nile; dedicating himſelf entirely to a ſtudious and ſolitary life. The moſt extraordinary attempt, however, that ever was made to diſcover the ſource of this or any other river, was that of a German nobleman named *Peter Joſeph de Roux*, comte de Deſreval. He had been in the Daniſh navy from the year 1721; and, in 1739, was made rear-admiral. That ſame year he reſigned his commiſſion, and began his attempt to diſcover the ſource of the Nile in Egypt. To this country he took his wife along with him; and had no ſooner reached Cairo, than he quarrelled with a Turkiſh mob on a point of etiquette; which inſtantly brought upon them the janizaries and guards of police, to take them into cuſtody. The counteſs exerted herſelf in an extraordinary manner; and armed only with a pair of ſciſſars, put all the janizaries to flight, and even wounded ſeveral of them; ſo that her huſband was left at liberty to purſue his plan of diſcovery. To accompliſh this, he provided a barge with ſmall cannon, and furniſhed with all neceſſary proviſions for himſelf and his wife, who was ſtill to accompany him. Before he ſet out, however, it was ſuggeſted to him, that, ſuppoſing government might protect him ſo far as to allow his barge to paſs the confines of Egypt ſafely, and to the firſt cataract; ſuppoſing alſo that ſhe was arrived at Ibrim, or Deir, the laſt garriſons depending on Cairo; yet ſtill ſome days journey above the garriſons of Deir and Ibrim began the dreadful deſerts of Nubia; and farther ſouth, at the great cataract of Jan Adel, the Nile falls 20 feet down a perpendicular rock—ſo that here his voyage muſt undoubtedly end. The count, however, flattered himſelf with being able to obtain ſuch aſſiſtance from the garriſons of Ibrim and Deir as would enable him to take the veſſel to pieces, and to carry it above the cataract, where it could again be launched into the river. To facilitate this ſcheme he had even entered into a treaty with ſome of the barbarians named *Kennouſs*, who reſide near the cataract, and employ themſelves in gathering ſena, which abounds in their country. Theſe promiſed to aſſiſt him in this extraordinary adventure; but, luckily for the count, he ſuffered himſelf at laſt to be perſuaded by ſome Venetian merchants at Cairo not to proceed in perſon on ſuch a dangerous and unheard of navigation, but rather to depute Mr Norden, his lieutenant, who was likewiſe to ſerve as his draughtſman, to recoinnoitre the forts of Ibrim and Deir, as well as the cataract of Jan Adel, and renew his treaty with the Kennouſs. This gentleman accordingly embarked upon one of the veſſels common on the Nile, but met with a great many difficulties and diſaſters before he could reach Syene and the firſt cataract; after which having with ſtill greater difficulty reached Ibrim, inſtead of meeting with any encouragement for the count to proceed on his voyage, he was robbed of all he had by the governor of the fort, and narrowly eſcaped with his life; it having been for ſome time determined by him and his ſoldiers, that Mr Norden ſhould be put to death. By theſe difficulties the count was ſo much diſheartened, that he determined to make no more attempts on the Nubian ſide. He now reſolved to enter Abyſſinia by the iſland of Maſuah. With this view he undertook a voyage round the Cape of Good Hope, in order to reach the Red ſea by the ſtraits of Babelmandel: but having begun to uſe his Spaniſh commiſſion, and taken two Engliſh ſhips, he was met by Commodore Barnet, who made prizes of all the veſſels he had with him, and ſent home the count himſelf paſſenger in a Portugueſe ſhip to Liſbon.

Thus Mr Bruce conſiders himſelf as the firſt European who reached the ſources of this river. He informs us that they are in the country of the Agows, as Kircher had ſaid; ſo that the latter muſt either have viſited them himſelf, or have had very good information concerning them. The name of the place through which is the paſſage to the territory of the Agows, is *Abala*; a plain or rather valley, generally about half a mile, and never exceeding a whole mile, in breadth. The mountains which ſurround it are at firſt of an inconſiderable height, covered to the very top with herbage and acacia trees; but as they proceed to the ſouthward they become more rugged and woody.—On the top of theſe mountains are delightful plains, producing excellent paſture. Thoſe to the weſt join a mountain called *Aformaſka*, where, from a direction nearly ſouth-eaſt, they turn ſouth, and encloſe the villages and territory of Sacala, which lie at the foot of them; and ſtill lower, that is, more to the weſtward, is the ſmall village of Geeſh, where the fountains of the Nile are ſituated. Here the mountains are in the form of a creſcent; and along theſe the river takes its courſe. Thoſe which encloſe the eaſt ſide of the plain run parallel to the former in their whole courſe, making part of the mountains of Lechtambara, or at leaſt joining with them, and theſe two, when behind Aformaſka, turn to the ſouth, and then to the ſouth-weſt, taking the ſame form as they do; only making a greater curve, and encloſing them likewiſe in the form of a creſcent, the extremity of which terminates immediately above a ſmall lake named *Gooderoo* in the plain of Aſſoa, below Geeſh, and directly at the fountains of the Nile.

Having paſſed ſeveral conſiderable ſtreams, all of which empty themſelves into the Nile, our traveller found himſelf at laſt obliged to aſcend a very ſteep and rugged mountain, where no other path was to be found but a very narrow one made by the ſheep or goats, and which in ſome places was broken, and full of holes; in others, he was obſtructed with large ſtones, which ſeemed to have remained there ſince the creation. The whole was covered with thick wood; and he was everywhere ſtopped by the kantuffa, as well as by ſeveral other thorny plants, almoſt as troubleſome as that. Having at laſt, however, reached the top, he had a ſight of the Nile immediately below him ; but ſo diminiſhed in ſize, that it now appeared only a brook ſcarce ſufficient to turn a mill. The village of Geeſh is not within ſight of the fountains of the river, though not more than 600 yards diſtant from them. The country about that place terminates in a cliff of about 300 yards high, which reaches down to the plain of Aſſoa, continuing in the ſame degree of elevation till it meets the Nile again about 17 miles to the ſouthward, after having made the circuit of the provinces of Gojam and Damot. In the middle of this cliff is a vaſt cave running ſtraight northward, with many by paths forming a natural labyrinth, of ſufficient bigneſs to contain the inhabitants of the whole village with their cattle. Into this Mr Bruce advanced about 100 yards ; but he did not chooſe to go farther, as the candle he carried with him ſeemed ready to go out ; and the people aſſured him that there was nothing remarkable to be ſeen at the end. The face of this cliff, fronting the ſouth, affords a very pictureſque view from the plain of Aſſoa below ; parts of the houſes appearing at every ſtage through the buſhes and thickets of trees. The mouths of the cavern above mentioned, as well as of ſeveral others which Mr Bruce did not ſee, are hid by almoſt impenetrable fences of the worſt kind of thorn ; nor is there any other communication betwixt the upper part and the houſes but by narrow winding ſheep paths, very difficult to be diſcovered ; all of them being allowed to be overgrown, as a part of the natural defence of the people. The edge of the cliff is covered with lofty and high trees, which ſeem to form a natural fence to prevent people from falling down : and the beauty of the flowers which the Abyſſinian thorns bear, ſeems to make ſome amends for their bad qualities. From the edge of the cliff of Geeſh, above where the village is ſituated, the ground ſlopes with a deſcent due north, till we come to a triangular marſh upwards of 86 yards broad, and 286 from the edge of the cliff, and from a prieſt's houſe where Mr Bruce reſided. On the eaſt, the ground deſcends with a very gentle ſlope from the large village of Sacala, which gives its name to the territory, and is about ſix miles diſtant from the ſource, though to appearance not above two. About the middle of this marſh, and not quite 40 yards from the foot of the mountain of Geeſh, riſes a circular hillock about three feet from the ſurface of the marſh itſelf, though founded apparently much deeper in it. The diameter of this hillock is not quite 12 feet, and it is ſurrounded by a ſhallow trench which collects the water, and ſends it off to the eaſtward. This is firmly built of ſod brought from the ſides, and kept conſtantly in repair by the Agows, who worſhip the river, and perform their religious ceremonies upon this as an altar. In the midſt of it is a circular hole, in the formation or enlargement of which the work of art is evidently diſcernible. It is always kept clear of graſs and aquatic plants, and the water in it is perfectly pure and limpid, but without any ebullition or motion diſcernible on its ſurface. The mouth is ſome parts of an inch leſs than three feet diameter, and at the time our author firſt viſited it (Nov. 5. 1770), the water ſtood about two inches from the brim, nor did it either increaſe or diminiſh during all the time of his reſidence at Geeſh. On putting down the ſhaft of a lance, he found a very feeble reſiſtance at ſix feet four inches, as if from weak ruſhes and graſs ; and, about ſix inches deeper, he found his lance had entered into ſoft earth, but met with no obſtruction from ſtones or gravel : and the ſame was confirmed by uſing a heavy plummet, with a line beſmeared with ſoap.—This is the firſt fountain of the Nile.

The ſecond fountain is ſituated at about ten feet diſtant from the former, a little to the weſt of ſouth ; and is only 11 inches in diameter, but eight feet three inches deep. The third is about 20 feet SSW from the firſt ; the mouth being ſomewhat more than two feet in diameter, and five feet eight inches in depth. Theſe fountains are made uſe of as altars, and from the foot of each iſſues a briſk running rill, which, uniting with the water of the firſt trench, goes off at the eaſt ſide in a ſtream which, our author conjectures, would fill a pipe about two inches diameter. The water of theſe fountains is extremely light and good, and intenſely cold, though expoſed to the ſcorching heat of the ſun, without any ſhelter ; there being no trees nearer than the cliff of Geeſh. The longitude of the principal fountain was found by Mr Bruce to be 36° 55′ 30″ E. from Greenwich. The elevation of the ground, according to his account, muſt be very great, as the barometer ſtood only at 22 Engliſh inches. "Neither (ſays he) did it vary ſenſibly from that height any of the following days I ſtaid at Geeſh ; and thence I inferred, that at the ſources of the Nile I was then more then two miles above the level of the ſea ; a prodigious height, to enjoy a ſky perpetually clear, as alſo a hot ſun never overcaſt for a moment with clouds from riſing to ſetting." In the morning of Nov. 6. the thermometer ſtood at 44°, at noon 96°, and at ſunſet 46°. It was ſenſibly cold at night, and ſtill more ſo about an hour before ſunriſe.

The Nile thus formed by the union of ſtreams from theſe three fountains, runs eaſtward through the marſh for about 30 yards, with very little increaſe of its water, but ſtill diſtinctly viſible, till it is met by the graſſy brink of the land deſcending from Sacala. By this it is turned gradually NE, and then due north ; and in the two miles in which it flows in that direction it receives many ſmall ſtreams from ſprings on each ſide ; ſo that about this diſtance from the fountains it becomes a ſtream capable of turning a common mill. Our traveller was much taken with the beauty of this ſpot. "The ſmall riſing hills about us (ſays he) were all thick covered with verdure, eſpecially with clover the largeſt and fineſt I ever ſaw ; the tops of the heights covered with trees of a prodigious ſize : the ſtream, at the banks of which we were ſitting, was limpid, and pure as the fineſt cryſtal ; the ſod covered thick with a kind of buſhy tree, that ſeemed to affect to grow to no height, but, thick with foliage and young branches, rather to aſſiſt the ſurface of the water ; whilſt it bore, in prodigious quantities, a beautiful yellow flower, not unlike a ſingle roſe of that colour, but without thorns ; and indeed, upon examination, we found that it was not a ſpecies of the roſe, but of the hypericum."

Here Mr Bruce exults greatly in his ſucceſs ; as

[illegible]

having not only ſeen the fountains of the Nile, but the river itſelf running in a ſmall ſtream; ſo that the ancient ſaying of the poet,

Nec licuit populis parvum te Nile videre,

could not be applied to him. Here he *ſtepped* over it, he ſays, more than 50 times, though he had told us, in the preceding page, that it was *three yards* over. From this ford, however, the Nile turns to the weſtward; and, after running over looſe ſtones occaſionally in that direction about four miles farther, there is a ſmall cataract of about ſix feet in height; after which it leaves the mountainous country, and takes its courſe through the plains of Goutto. Here it flows ſo gently that its motion is ſcarcely to be perceived, but turns and winds in its direction more than any river he ever ſaw; forming more than 20 ſharp angular peninſulas in the ſpace of five miles. Here the ſoil is compoſed of a marſhy clay, quite deſtitute of trees, and very difficult to travel through; and where its ſtream receives no conſiderable addition. Iſſuing out from thence, however, it is joined by ſeveral rivulets which fall from the mountains on each ſide, ſo that it becomes a conſiderable ſtream, with high and broken banks covered with old timber trees for three miles. In its courſe it inclines to the north-eaſt, and winds very much, till it receives firſt a ſmall river named *Diwa*, and then another named *Dee-ohha*, or the river Dee. Turning then ſharply to the eaſt, it falls down another cataract, and about three miles below receives the Jemma, a pure and limpid ſtream, not inferior in ſize to itſelf. Proceeding ſtill to the northward, it receives a number of other ſtreams, and at laſt croſſes the ſouthern part of the lake Tzana or Dembea, preſerving the colour of its ſtream during its paſſage, and iſſuing out at the weſt ſide of it in the territory of Dara.

There is a ford, though very deep and dangerous, at the place where the Nile firſt aſſumes the name of a river, after emerging from the lake Dembea: but the ſtream in other places is exceedingly rapid: the banks in the courſe of a few miles become very high, and are covered with the moſt beautiful and variegated verdure that can be conceived. It is now confined by the mountains of Begemder till it reaches Alata, where is the third cataract. This, we are informed by Mr Bruce, is the moſt magnificent ſight he ever beheld; but he thinks that the height has rather been exaggerated by the miſſionaries, who make it 50 feet; and after many attempts to meaſure it, he is of opinion that it is nearly 40 feet high. At the time he viſited it, the river had been pretty much ſwelled by rains, and fell in one ſheet of water, without any interval, for the ſpace of half an Engliſh mile in breadth, with ſuch a noiſe as ſtunned and made him giddy for ſome time. The river, for ſome ſpace both above and below the fall, was covered with a thick miſt, owing to the ſmall particles of the water daſhed up into the air by the violence of the ſhock. The river, though ſwelled beyond its uſual ſize, retained its clearneſs, and fell into a natural baſon of rock; the ſtream appearing to run back againſt the foot of the precipice over which it falls with great violence; forming innumerable eddies, waves, and being in exceſſive commotion, as may eaſily be imagined. Jerome Lobo pretends that he was able to reach the foot of the rock, and ſit under the prodigious arch of water ſpouting over it; but Mr Bruce does not heſitate to pronounce this to be an abſolute falſehood. The noiſe of the cataract, which, he ſays, is like the loudeſt thunder, could not but confound and deſtroy his ſenſe of hearing; while the rapid motion of the water before his eyes would dazzle the ſight, make him giddy, and utterly deprive him of all of his intellectual powers. "It was a moſt magnificent ſight (ſays Mr Bruce), that ages, added to the greateſt length of human life, would not deface or eradicate from my memory: it ſtruck me with a kind of ſtupor, and a total oblivion of where I was, and of every other ſublunary concern."

About half a mile below the cataract, the Nile is confined between two rocks, where it runs in a narrow channel with impetuous velocity and great noiſe. At the village of Alata there is a bridge over it, conſiſting of one arch, and that no more than 25 feet wide. This bridge is ſtrongly fixed into the ſolid rock on both ſides, and ſome part of the parapets ſtill remain. No crocodiles ever come to Alata, nor are any ever ſeen beyond the cataract.

Below this tremendous water-fall the Nile takes a ſouth-eaſt direction, along the weſtern ſide of Begemder and Amhara on the right, encloſing the province of Gojam. It receives a great number of ſtreams from both ſides, and after ſeveral turns takes at laſt a direction almoſt due north, and approaches within 62 miles of its ſource. Notwithſtanding the vaſt increaſe of its waters, however, it is ſtill fordable at ſome ſeaſons of the year; and the Galla croſs it at all times without any difficulty, either by ſwimming, or on goats-ſkins blown up like bladders. It is likewiſe croſſed on ſmall rafts, placed on two ſkins filled with wind; or by twiſting their hands round the tails of the horſes who ſwim over; a method always uſed by the women who follow the Abyſſinian armies, and are obliged to croſs unfordable rivers. In this part of the river crocodiles are met with in great numbers; but the ſuperſtitious people pretend they have charms ſufficiently powerful to defend themſelves againſt their voracity.—The Nile now ſeems to have forced its paſſage through a gap in ſome very high mountains which bound the country of the Ganges, and falls down a cataract of 280 feet high; and immediately below this are two others, both of very conſiderable height. Theſe mountains run a great way to the weſtward, where they are called *Dyre* or *Tegla*, the eaſtern end of them joining the mountains of Kueira, where they have the name of *Fazuclo*. Theſe mountains, our author informs us, are all inhabited by Pagan nations; but the country is leſs known than any other on the African continent. There is plenty of gold waſhed down from the mountains by the torrents in the rainy ſeaſon; which is the fine gold of Sennaar named *Tibbar*.

The Nile, now running cloſe by Sennaar in a direction nearly north and ſouth, makes afterwards a ſharp turn to the eaſt; affording a pleaſant view in the fair ſeaſon, when it is brim-full, and indeed the only ornament of that bare and inhoſpitable country. Leaving Sennaar, it paſſes by many large towns inhabited by Arabs, all of them of a white complexion; then paſſing Gerri, and turning to the north-eaſt, it joins the Tacazze, paſſing, during its courſe through this country,

try a large and populous town named *Chendi*, probably the Candace of the ancients. Here Mr Bruce ſuppoſes the ancient iſland or peninſula of Meroe to have been ſituated. Having at length received the great river Atbara, the Aſtaboras of the ancients, it turns directly north for about two degrees; then making a very unexpected turn weſt by ſouth for more than two degrees in longitude, and winding very little, it arrives at Korti, the firſt town in Barabra, or kingdom of Dongola. From Korti it runs almoſt ſouthweſt till it paſſes Dongola, called alſo *Beja*, the capital of Barabra; after which it comes to Moſcho, a conſiderable town and place of refreſhment to the caravans when they were allowed to paſs from Egypt to Ethiopia. From thence turning to the north-eaſt it meets with a chain of mountains in about 22° 15′ of N. latitude, where is the ſeventh cataract named *Jan Adel*. This is likewiſe very tremendous, though not above half as high as that of Alata. This courſe is now continued till it falls into the Mediterranean; there being only one other cataract in the whole ſpace, which is much inferior to any of thoſe already deſcribed.

This very particular and elaborate account of the ſources of the Nile and of the courſe of the river given by Mr Bruce, hath not eſcaped criticiſm. We find him accuſed by the reviewers, not only of having brought nothing to light that was not previouſly known to the learned, but even of having revealed nothing which was not previouſly publiſhed in Guthrie's Geographical Grammar. This, however, ſeems by no means a fair and candid criticiſm. If the ſources of the Nile, as deſcribed by Mr Bruce, were known to the author of Guthrie's Grammar, they muſt likewiſe have been ſo to every retailer of geography ſince the time of the miſſionaries; which, as the reviewers have particularized that book, would not ſeem to have been the caſe. If any thing new was publiſhed there previous to the appearance of Mr Bruce's work, it muſt probably have been derived indirectly from himſelf; of which clandeſtine method of proceeding that gentleman has had frequent occaſion to complain in other caſes. It is alleged, however, that he has given the name of *Nile* to a ſtream which does not deſerve it. This, like all other large rivers, is compoſed of innumerable branches; to viſit the top of every one of which would be indeed an Herculean taſk. The ſource of the largeſt branch therefore, and that which has the longeſt courſe, is undoubtedly to be accounted the ſource of the river; but here it is denied that Mr Bruce had ſufficient information. "Of the innumerable ſtreams (ſay they) that feed the lake of Tzana, there is one that ends in a bog, to which Mr Bruce was conducted by Woldo, a lying guide, who told him it was the ſource of the Nile. Mr Bruce, in a matter of far leſs importance, would not have taken Woldo's word; but he is perſuaded, that in this caſe he ſpoke truth; becauſe the credulous barbarians of the neighbouring diſtrict paid ſomething like worſhip to this brook, which, at the diſtance of 14 miles from its ſource, is not 20 feet broad, and nowhere one foot deep. Now it is almoſt unneceſſary to obſerve, that the natives of that country being, according to Mr Bruce's report, pagans, might be expected to worſhip the pure and ſalutary ſtream; to which, with other extraordinary qualities, their ſuperſtition aſcribed the power of curing the bite of a mad dog. Had he traced to its ſource any of the other rivulets which run into the lake Tzana, it is not unlikely that he might have met with ſimilar inſtances of credulity among the ignorant inhabitants of its banks. Yet this would not prove any one of them in particular to be the head of the Nile. It would be trifling with the patience of our readers to ſay one word more on the queſtion, whether the Portugueſe Jeſuits or Mr Bruce diſcovered what they erroneouſly call the head of the Nile. Before either they or he had indulged themſelves in a vain triumph over the labours of antiquity, they ought to have been ſure that they had effected what antiquity was unable to accompliſh. Now the river deſcribed by the Jeſuit Kircher, who collected the information of his brethren, as well as by Mr Bruce, is not the Nile of which the ancients were in queſt. This is amply proved by the prince of modern geographers, the incomparable D'Anville (at leaſt till our own Rennel appeared), in a copious Memoir publiſhed in the 26th volume of the Memoirs of the Academy of Belles Lettres, p. 45.—To this learned diſſertation we refer our readers; adding only what ſeems probable from the writings of Diodorus Siculus and Herodotus, that the ancients had two meanings when they ſpoke of the head or ſource of the Nile: Firſt, Literally, the head or ſource of that great weſtern ſtream now called the *White River*; which contains a much greater weight of waters, and has a much longer courſe than the river deſcribed by the Jeſuits and by Mr Bruce: and, 2dly, Metaphorically, the cauſe of the Nile's inundation.—This cauſe they had diſcovered to be the tropical rains, which fall in the extent of 16 degrees on each ſide of the line; which made the ſacriſtan of Minerva's temple of Sais in Egypt tell that inquiſitive traveller Herodotus, that the waters of the Nile run in two oppoſite directions from its ſource; the one north into Egypt, the other ſouth into Ethiopia; and the reports of all travellers into Africa ſerve to explain and confirm this obſervation. The tropical rains they acknowledge, give riſe to the Nile and all its tributary ſtreams which flow northward into the kingdom of Sennaar, as well as to the Zebee, and ſo many large rivers which flow ſouth into Ethiopia; and then, according to the inclination of the ground, fall into the Indian or Atlantic ocean. Such then, according to the Egyptian prieſts, is the true and philoſophical ſource of the Nile; a ſource diſcovered above 3000 years ago, and not, as Mr Bruce and the Jeſuits have ſuppoſed, the head of a paltry rivulet, one of the innumerable ſtreams that feed the lake Tzana."

On this ſevere criticiſm, however, it is obvious to remark, that if the ſource of the Nile had been diſcovered ſo many years ago, there is not the leaſt probability that the finding of it ſhould have been deemed an impoſſible undertaking, which it moſt certainly was, by the ancients.—That the finding out the fountains of the river itſelf was an object of their inquiry, cannot be doubted; and from the accounts given by Mr Bruce, it appears very evident that none of the ancients had equal ſucceſs with himſelf; though indeed the Jeſuits, as has already been obſerved, ſeem to have a right to diſpute it with him. From the correſpondence of his accounts with that of the Jeſuits, it appears certain that the moſt conſiderable ſtream which flows into the lake Tzana takes its riſe from the fountains at Geeſh already deſcribed; and that it is the moſt conſiderable plainly appears from its ſtream being viſible through the whole breadth of the lake, which is not the caſe with any of the reſt. The preference given to this ſtream by the Agows, who worſhip it, ſeems alſo an inconteſtable proof that they look upon it to be the great river which paſſes through Ethiopia and Egypt; nor will the argument of the reviewers hold good in *ſuppoſing* that other ſtreams are worſhipped, unleſs they could prove that they are ſo. As little can it be any objection or diſparagement to Mr Bruce's labours, that he did not diſcover the ſources of the weſtern branch of the Nile called the *White River*. Had he done ſo, it might next have been objected that he did not viſit the ſprings of the Tacazze, or any other branch. That the origin of the White river was unknown to the ancients may readily be allowed; but ſo were the fountains of Geeſh, as evidently appears from the erroneous poſition of the ſources of the eaſtern branch of the Nile laid down by Ptolemy. Our traveller, therefore, certainly has the merit, if not of diſcovering the ſources, at leaſt of confirming the accounts which the Jeſuits have given of the ſources, of the river called the *Nile*; and of which the White river, whether greater or ſmaller, ſeems to be accounted only a branch. The ſuperior veneration paid to the eaſtern branch of this celebrated river will alſo appear from the variety of names given to it, as well as from the import of theſe names; of which Mr Bruce gives the following account.

By the Agows it is named *Gzeir*, *Geeſa*, or *Seir;* the firſt of which term ſignifies *a god*. It is likewiſe named *Ab*, father; and has many other names, all of them implying the moſt profound veneration. Having deſcended into Gojam it is named *Abay;* which, according to Mr Bruce, ſignifies the river that ſuddenly ſwells and overflows periodically with rain. By the Gongas on the ſouth ſide of the mountains Dyre and Tagla, it is called *Dabli*, and by thoſe on the north ſide *Kowaſs;* both of which names ſignify a *watching dog*, the *latrator anubis*, or *dog-ſtar*. In the plain country between Fazurlo and Sennaar it is called *Nile* which ſignifies *blue;* and the Arabs interpret this name by the word *Azergue;* which name it retains till it reaches Halfaia, where it receives the White river.

Formerly the Nile had the name of *Siris*, both before and after it enters Beja, which the Greeks imagined was given to it on account of its black colour during the inundation; but Mr Bruce aſſures us that the river has no ſuch colour. He affirms, with great probability, that this name in the country of Beja imports the river of the *dog-ſtar*, on whoſe vertical appearance this river overflows; "and this idolatrous worſhip (ſays he) was probably part of the reaſon of the queſtion the prophet Jeremiah aſks: And what haſt thou to do in Egypt to drink the water of Seir, or the water profaned by idolatrous rites?" As for the firſt, it is only the tranſlation of the word *bahar* applied to the Nile. The inhabitants of the Barabra to this day call it *Bahar el Nil*, or the ſea of the Nile, in contradiſtinction to the Red ſea, for which they have no other name than *Bahar el Molech*, or the Salt ſea. The junction of the three great rivers, the Nile flowing on the weſt ſide of Meroe; the Tacazze, which waſhes the eaſt ſide, and joins the Nile at Maggiran in N. Lat. 17°; and the Mareb, which falls into this laſt ſomething above the junction, gives the name of *Triton* to the Nile.

The name *Ægyptus*, which it has in Homer, and which our author ſuppoſes to have been a very ancient name even in Ethiopia, is more difficult to account for. This has been almoſt univerſally ſuppoſed to be derived from the black colour of the inundation; but Mr Bruce, for the reaſons already given, will not admit of this. "Egypt (ſays he) in the Ethiopic is called *y Gipt*, Agar; and an inhabitant of the country, *Gypt*, for preciſely ſo it is pronounced; which means the country of ditches or canals, drawn from the Nile on both ſides at right angles with the river: nothing ſurely is more obvious than to write *y Gipt*, ſo pronounced, *Egypt;* and, with its termination *us* or *os*, *Egyptus*. The Nile is alſo called *Kronides*, Jupiter; and has had ſeveral other appellations beſtowed upon it by the poets; though theſe are rather of a tranſitory nature than to be ranked among the ancient names of the river. By ſome of the ancient fathers it has been named *Geon;* and by a ſtrange train of miracles they would have it to be one of the rivers of the terreſtrial paradiſe; the ſame which is ſaid to have encompaſſed the whole land of Cuſh or Ethiopia. To effect this, they are obliged to bring the river a great number of miles, not only under the earth, but under the ſea alſo; but ſuch reveries need no refutation.

Under the article EGYPT we have ſo fully explained the cauſe of the annual inundation of the Nile, that, with regard to the phenomenon itſelf, nothing farther ſeems neceſſary to be added. We ſhall therefore only extract from Mr Bruce's work what he has ſaid concerning the mode of natural operation by which the tropical rains are produced; which are now univerſally allowed to be the cauſe of the annual overflowing of this and other rivers.

According to this gentleman, the air is ſo much rarefied by the ſun during the time that he remains almoſt ſtationary over the tropic of Capricorn, that the other winds loaded with vapours ruſh in upon the land from the Atlantic ocean on the weſt, the Indian ocean on the eaſt, and the cold Southern ocean beyond the Cape. Thus a great quantity of vapour is gathered, as it were, into a focus; and as the ſame cauſes continue to operate during the progreſs of the ſun n[illegible]ward, a vaſt train of clouds proceed from ſouth to north, which, Mr Bruce informs us, are ſometimes extended much farther than at other times. Thus he tells us, that for two years ſome white dappled clouds were ſeen at Gondar, on the 7th of January; the ſun being then 34° diſtant from the zenith, and not the leaſt cloudy ſpeck having been ſeen for ſeveral mouths before. About the firſt of March, however, it begins to rain at Gondar but only for a few minutes at a time in large drops; the ſun being then about 5° diſtant from the zenith. The rainy ſeaſon commences with violence at every place when the ſun comes directly over it; and before it commences at Gondar, green boughs and leaves appear floating in the Bahar el Abiad, or White river, which, according to the accounts given by the Galla, our author ſuppoſes to take its riſe in about 5° north latitude.

The rains therefore precede the ſun only about 5°; but they continue and increaſe after he has paſſed it. In April all the rivers in the ſouthern parts of Abyſſinia begin to ſwell, and greatly augment the Nile, which is now alſo farther augmented by the vaſt quantity of water poured into the lake Tzana. On the firſt days of May, the ſun paſſes the village of Gerri, which is the limit of the tropical rains; and it is very remarkable, that, though the ſun ſtill continues to operate with unabated vigour, all his influence cannot bring the clouds farther northward than this village; the reaſon of which Mr Bruce, with great reaſon, ſuppoſes, to be the want of mountains to the northward. In confirmation of this opinion, he obſerves, that the tropical rains ſtop at the latitude of 14° inſtead of 16° in the weſtern part of the continent. All this time, however, they continue violent in Abyſſinia; and in the beginning of June the rivers are all full, and continue ſo while the ſun remains ſtationary in the tropic of Cancer.

This exceſſive rain, which would ſweep off the whole ſoil of Egypt into the ſea were it to continue without intermiſſion, begins to abate as the ſun turns ſouthward; and on his arrival at the zenith of each place, on his paſſage towards that quarter, they ceaſe entirely: the reaſon of which is no leſs difficult to be diſcovered than that of their coming on when he arrives at the zenith in his paſſage northward. Be the reaſon what it will, however, the fact is certain; and not only ſo, but the time of the rains ceaſing is exact to a ſingle day; inſomuch, that on the 25th of September the Nile is generally found to be at its higheſt at Cairo, and begins to diminiſh every day after. Immediately after the ſun has paſſed the line, he begins the rainy ſeaſon to the ſouthward; the rains conſtantly coming on with violence as he approaches the zenith of each place; but the inundation is now promoted in a different manner, according to the difference of circumſtances in the ſituation of the places. From about 6° S. Lat. a chain of high mountains runs all the way along the middle of the continent towards the Cape of Good Hope, and interſects the ſouthern part of the peninſula nearly in the ſame manner that the Nile does the northern. A ſtrong wind from the ſouth, ſtopping the progreſs of the condenſed vapours, daſhes them againſt the cold ſummits of this ridge of mountains, and forms many rivers, which eſcape in the direction either of eaſt or weſt as the level preſents itſelf. If this is towards the weſt, they fall down the ſides of the mountains into the Atlantic, and if on the eaſt into the Indian ocean.—"The clouds (ſays Mr Bruce), drawn by the violent action of the ſun, are condenſed, then broken, and fall as rain on the top of this high ridge, and ſwell every river; while a wind from the ocean on the eaſt blows like a monſoon up each of theſe ſtreams, in a direction contrary to their current during the whole time of the inundation; and this enables boats to aſcend into the weſtern parts of Sofala, and the interior country, to the mountains where lies the gold. The ſame effect, from the ſame cauſe, is produced on the weſtern ſide towards the Atlantic; the high ridge of mountains being placed between the different countries weſt and eaſt, is at once the ſource of their riches, and of thoſe rivers which conduct to the treaſures, which would be otherwiſe inacceſſible, in the eaſtern parts of the kingdoms of Benin, Congo, and Angola.

"There are three remarkable appearances attending the inundation of the Nile. Every morning in Abyſſinia is clear, and the ſun ſhines. About nine, a ſmall cloud, not above four feet broad, appears in the eaſt, whirling violently round as if upon an axis; but arrived near the zenith, it firſt abates its motion, then loſes its form, and extends itſelf greatly, and ſeems to call up vapours from all the oppoſite quarters. Theſe clouds having attained nearly the ſame height, ruſh againſt each other with great violence, and put me always in mind of Eliſha foretelling rain on Mount Carmel. The air, impelled before the heavieſt maſs, or ſwifteſt mover, makes an impreſſion of its form on the collection of clouds oppoſite; and the moment it has taken poſſeſſion of the ſpace made to receive it, the moſt violent thunder poſſible to be conceived inſtantly follows, with rain: after ſome hours the ſky again clears, with a wind at north: and it is always diſagreeably cold when the thermometer is below 63°.

"The ſecond thing remarkable is the variation of the thermometer. When the ſun is in the ſouthern tropic, 36° diſtant from the zenith of Gondar, it is ſeldom lower than 72°; but it falls to 60°, and 63°, when the ſun is immediately vertical; ſo happily does the approach of rain compenſate the heat of a too ſcorching ſun.

The third is that remarkable ſtop in the extent of the rain northward, when the ſun, that has conducted the vapours from the line, and ſhould ſeem now more than ever to be in the poſſeſſion of them, is here overruled ſuddenly; till, on its return to Gorri, again it reſumes the abſolute command over the rain, and reconducts it to the line, to furniſh diſtant deluges to the ſouthward."

With regard to the Nile itſelf, it has been ſaid that the quantity of earth brought down by it from Abyſſinia is ſo great, that the whole land of Egypt is produced from it. This queſtion, however, is diſcuſſed under the article EGYPT, where it is ſhown that this cannot poſſibly be the caſe.—Among other authorities there quoted was that of Mr Volney, who ſtrenuouſly argues againſt the opinion of Mr Savary and others, who have maintained that Egypt is the gift of the Nile. Notwithſtanding this, however, we find him aſſerting that the ſoil of Egypt has undoubtedly been augmented by the Nile: in which caſe it is not unreaſonable to ſuppoſe that it has been produced by it altogether.—"The reader (ſays he) will conclude, doubtleſs, from what I have ſaid, that writers have flattered themſelves too much in ſuppoſing they could fix the preciſe limits of the enlargement and riſe of the Delta. But, though I would reject all illuſory circumſtances, I am far from denying the fact to be well founded; it is too plain from reaſon, and an examination of the country. The riſe of the ground appears to me demonſtrated by an obſervation on which little ſtreſs has been laid. In going from Roſetta to Cairo, when the waters are low, as in the month of March, we may remark, as we go up the river, that the ſhore riſes gradually above the water; ſo that if overflowed two feet at Roſetta, it overflows from three to four at Faoua, and upwards of twelve at Cairo (A). Now by reaſoning from this fact, we may deduce the proof of an increaſe by ſediment; for the layer of mud being in proportion to the thickneſs of the ſheets of water by which it is depoſited, muſt be more or leſs conſiderable as theſe are of a greater or leſs depth; and we have ſeen that the like gradation is obſervable from Aſouan to the ſea.

"On the other hand, the increaſe of the Delta manifeſts itſelf in a ſtriking manner, by the form of Egypt along the Mediterranean. When we conſider its figure on the map, we perceive that the country which is in the line of the river, and evidently formed of foreign materials, has aſſumed a ſemicircular ſhape, and that the ſhores of Arabia and Africa, on each ſide, have a direction towards the bottom of the Delta; which manifeſtly diſcovers that this country was formerly a gulf, that in time has been filled up.

"This accumulation is common to all rivers, and is accounted for in the ſame manner in all: the rain water and the ſnow deſcending from the mountains into the valleys, hurry inceſſantly along with them the earth they waſh away in their deſcent. The heavier parts, ſuch as pebbles and ſands, ſoon ſtop, unleſs forced along by a rapid current. But when the waters meet only with a fine and light earth, they carry away large quantities with the greateſt facility. The Nile, meeting with ſuch a kind of earth in Abyſſinia and the interior parts of Africa, its waters are loaded and its bed filled with it; nay, it is frequently ſo embarraſſed with this ſediment as to be ſtraitened in its courſe. But when the inundation reſtores to it its natural energy, it drives the mud that has accumulated toward the ſea, at the ſame that it brings down more for the enſuing ſeaſon; and this, arrived at its mouth, heaps up, and forms ſhoals, where the declivity does not allow ſufficient action to the current, and where the ſea produces an equilibrium of reſiſtance. The ſtagnation which follows occaſions the groſſer particles, which till then had floated, to ſink; and this takes place more particularly in thoſe places where there is leaſt motion, as towards the ſhores, till the ſides become gradually enriched by the ſpoils of the upper country and of the Delta itſelf; for if the Nile takes from Abyſſinia to give to the Thebais, it likewiſe takes from the Thebais to give to the Delta, and from the Delta to carry to the ſea. Wherever its waters have a current, it deſpoils the ſame territory that it enriches. As we aſcend towards Cairo, when the river is low, we may obſerve the banks worn ſteep on each ſide and crumbling in large flakes. The Nile, which undermines them, depriving their light earth of ſupport, it falls into the bed of the river; for when the water is high, the earth imbibes it; and when the ſun and drought return, it cracks and moulders away in great flakes, which are hurried along by the Nile."

Thus does Mr Volney argue for the increaſe of the Delta in the very ſame manner that others have argued for the production of the whole country of Egypt; an opinion which he is at great pains to refute. Under the article EGYPT, however, it is ſhown that the Nile does not bring down any quantity of mud ſufficient for the purpoſes aſſigned; and with regard to the argument drawn from the ſhallowneſs of the inundation when near the ſea, this does not prove any riſe of the land; but as Mr Rennel has judiciouſly obſerved in his remarks on the inundation of the Ganges, ariſes from the nature of the fluid itſelf. The reaſon, in ſhort, is this: The ſurface of the ſea is the loweſt point to which the waters of every inundation have a tendency; and when they arrive there, they ſpread themſelves over it with more eaſe than anywhere elſe, becauſe they meet with leſs reſiſtance. Their motion, however, by reaſon of the ſmall declivity, is leſs ſwift than that of the waters farther up the river, where the declivity is greater; and conſequently the latter being ſomewhat impeded in their motion, are in ſome degree accumulated. The ſurface of the inundation therefore, does not form a perfectly level plain, but one gradually ſloping from the interior parts of the country towards the ſea; ſo that at the greateſt diſtance from the ocean the water will always be deepeſt, even if we ſhould ſuppoſe the whole country to be perfectly ſmooth, and compoſed of the moſt ſolid materials.—This theory is eaſily underſtood from obſerving a quantity of water running along a wooden ſpout, which is always more ſhallow at the end of the ſpout where it runs off than at the other.—With regard to Mr Volney's other arguments, they are without doubt contradictory; for if, as he ſays, the river takes from Abyſſinia to give to the Thebais, from Thebais to give to the Delta, and from Delta to the ſea, it undoubtedly follows, that is gives nothing to any part of the land whatever, but that altogether is ſwept into the Mediterranean ſea; which, indeed, ſome very trifling quantities excepted, is moſt probably the caſe.

It has been remarked by Mr Pococke, a very judicious traveller, that, in the beginning of the inundation, the waters of the Nile turn red, and ſometimes green; and while they remain of that colour, they are unwholeſome. He explains this phenomenon by ſuppoſing, that the inundation at firſt brings away that red or green filth which may be about the lakes where it takes its riſe; or about the ſources of the ſmall rivers which flow into it, near its principal ſource; "for, ſays he, although there is ſo little water in the Nile when at loweſt, that there is hardly any current in many parts of it, yet it cannot be ſuppoſed that the water ſhould ſtagnate in the bed of the Nile ſo as to become green. Afterwards the water begins to be red and ſtill more turbid, and then it begins to be wholeſome."—This circumſtance is explained by Mr Bruce in the following manner: The country about Narea and Caffa, where the river Abiad takes its riſe, is full of immenſe marſhes, where, during the dry ſeaſon, the water ſtagnates, and becomes impregnated with every kind of corrupted matter. Theſe, on the commencement of the rains, overflow into the river Abiad, which takes its riſe there. The overflowing

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(A) "It would be curious to aſcertain in what proportion it continues up to Aſouan. Some Copts, whom I have interrogated on the ſubject, aſſured me that it was much higher through all the Said than at Cairo."

of theſe vaſt marſhes firſt carried the diſcoloured water into Egypt; after which follows that of the great lake Tzana, through which the Nile paſſes; which having been ſtagnated, and without rain, under a ſcorching ſun for ſix months, joins its putrid waters to the former. In Abyſſinia alſo, there are very few rivers that run after November, but all of them ſtand in prodigious pools, which, by the heat of the ſun, likewiſe turn putrid, and on the commencement of the rains throw off their ſtagnant water into the Nile; but at laſt, the rains becoming conſtant, all this putrid matter is carried off, and the ſources of the inundation become ſweet and wholeſome. The river then paſſing through the kingdom of Sennaar, the ſoil of which is this red bole, becomes coloured with that earth; and a mixture, along with the moving ſands of the deſerts, of which it receives a great quantity when raiſed by the wind, precipitates all the viſcous and putrid matters which float in the waters; whence Mr Pococke judiciouſly obſerves, that the Nile is not wholeſome when the water is clear and green, but when ſo red and turbid that it ſtains the water of the Mediterranean.

The rains in Abyſſinia, which ceaſe about the 8th of September, generally leave a ſickly ſeaſon in the low country; but the diſeaſes produced by theſe rains are removed by others which come on about the end of October, and ceaſe about the 8th of November. On theſe rains depend the latter crops of the Abyſſinians; and for theſe the Agows pray to the river, or the genius or ſpirit reſiding in it. In Egypt, however, the effect of them is ſeldom perceived; but in ſome years they prove exceſſive: and it has been obſerved that the Nile, after it has fallen, has again riſen in ſuch a manner as to alarm the whole country. This is ſaid to have happened in the time of Cleopatra, when it was ſuppoſed to preſage the extinction of the government of the Ptolemies; and in 1737 it was likewiſe imagined to portend ſome dreadful calamity.

The quantity of rain, by which all this inundation is occaſioned, varies conſiderably in different years; at leaſt at Gondar, where Mr Bruce had an opportunity of meaſuring it. In 1770 it amounted to 35½ inches; but in 1771 it amounted to no leſs than 41.355 inches from the vernal equinox to the 8th of September.—What our author adds concerning the variation of the rainy months ſeems totally irreconcilable with what he had before advanced concerning the extreme regularity of the natural cauſes by which the tropical rains are produced. "In 1770 (ſays he) Auguſt was the rainy month; in 1771, July.—When July is the rainy month, the rains generally ceaſe for ſome days in the beginning of Auguſt, and then a prodigious deal falls in the latter end of that month and firſt week of September. In other years July and Auguſt are the violent rainy months, while June is fair. And laſtly, in others, May, June, July, Auguſt and the firſt week of September."—If this is the caſe, what becomes of the regular attraction of the clouds by the ſun as he advances northward; of the coming on of the rains when he arrives at the zenith of any place, in his paſſage to the tropic of Cancer; and of their ceaſing when he comes to the ſame point in his return ſouthward.

Under the article **Ethiopia** we have mentioned a threat of one of the Abyſſinian monarchs, that he would direct the courſe of the Nile and prevent it from fertilizing the land of Egypt; and it has likewiſe been related, that conſiderable progreſs was made in this undertaking by another emperor. Mr Bruce has beſtowed an entire chapter on the ſubject; and is of opinion, that "there ſeems to be no doubt that it is poſſible to diminiſh or divert the courſe of the Nile, that it ſhould be inſufficient to fertilize the country of Egypt; becauſe the Nile, and all the rivers that run into it, and all the rains that ſwell theſe rivers, fall in a country two miles above the level of the ſea; therefore it cannot be denied, that there is level enough to divert many of the rivers into the Red ſea, or perhaps ſtill eaſier by turning the courſe of the river Abiad till it meets the level of the Niger, or paſs through the deſert into the Mediterranean.——Alphonſo Albuquerque is ſaid to have written frequently to the king of Portugal to ſend him pioneers from Madeira, with people accuſtomed to level grounds, and prepare them for ſugar canes; by whoſe aſſiſtance he meant to turn the Nile into the Red ſea. This undertaking, however, if it really had been projected, was never accompliſhed; nor indeed is there any probability that ever ſuch a mad attempt was propoſed. Indeed, though we cannot deny that there is a poſſibility in nature of accompliſhing it, yet the vaſt difficulty of turning the courſe of ſo many large rivers may juſtly ſtigmatize it as impracticable; not to mention the obſtacles which muſt naturally be ſuggeſted from the apparent inutility of the undertaking, and thoſe which would ariſe from the oppoſition of the Egyptians.

It has already been obſerved in a quotation from the reviewers, that Herodotus was informed by the ſacriſtan or ſecretary of the treaſury of Minerva, that one half of the waters of the Nile run north and the other ſouth. This is alſo taken notice of by Mr Bruce; who gives the following explanation of it. "The ſecretary was probably of that country himſelf, and ſeems by his obſervation to have known more of it than all the ancients together. In fact we have ſeen, that between 13° and 14° north latitude, the Nile, with all its tributary ſtreams, which have their riſe and courſe within the tropical rains, falls down into the flat country (the kingdom of Sennaar), which is more than a mile lower than the high country in Abyſſinia; and thence, with a little inclination, it runs into Egypt. Again, In latitude 9°, in the kingdom of Gingiro, the Zebee runs ſouth or ſouth-eaſt, into the Inner Ethiopia, as do alſo many other rivers, and, as I have heard from the natives of that country empty themſelves into a lake, as thoſe on the north ſide of the line do into the lake Tzana, thence diſtributing their waters to the eaſt and weſt. Theſe become the heads of great rivers, that run through the interior countries of Ethiopia (correſponding to the ſea coaſt of Melinda and Momboza) into the Indian ocean; whilſt, on the weſtward, they are the origin of the vaſt ſtreams that fall into the Atlantic, paſſing through Benin and Congo, ſouthward of the river Gambia and the Sierra Leona. In ſhort, the periodical rains from the tropic of Capricorn to the line, being in equal quantity with thoſe that fall between the line and the tropic of Cancer, it is plain, that if the land of Ethiopia ſloped equally from the line ſouthward and northward, the rains that fall ſhould go, the one half north and the other half ſouth; but as the ground from 5° north declines all ſouthward, it follows, that the rivers which run to the ſouthward muſt be equal to thoſe that run northward, *plus* the rain that falls in the 5° north latitude, where the ground begins to ſlope to the ſouthward; and there can be little doubt that this is at leaſt one of the reaſons why there are in the ſouthern continent ſo many rivers larger than the Nile, that run both into the Indian and Atlantic oceans."

From this account given to Herodotus, it has been ſuppoſed, by ſome writers on geography, that the Nile divides itſelf into two branches, one of which runs northward into Egypt, and one through the country of the Negroes weſtward into the Atlantic ocean. This opinion was firſt broached by Pliny.—It has been adopted by the Nubian geographer, who urges in ſupport of it, that if the Nile carried down all the rains which fall into it from Abyſſinia, the people of Egypt would not be ſafe in their houſes. But to this Mr Bruce anſwers, that the waſte of water in the burning deſerts through which the Nile paſſes is ſo great, that unleſs it was ſupplied by another ſtream, the White River, equal in magnitude to itſelf, and which, riſing in a country of perpetual rains, is thus always kept full, it never could reach Egypt at all, but would be loſt in the ſands, as is the caſe with many other very conſiderable rivers in Africa. "The rains (ſays he) are collected by the four great rivers in Abyſſinia; the Mareb, the Bowiha, the Tacazze, and the Nile. All theſe principal, and their tributary ſtreams, would, however, be abſorbed, nor be able to paſs the burning deſerts, or find their way into Egypt, were it not for the White River, which having its ſource in a country of almoſt perpetual rains, joins to it a never-failing ſtream equal to the Nile itſelf."

We ſhall conclude this article with ſome account of the Agows who inhabit the country about the ſources of the Nile. Theſe, according to Mr Bruce, are one of the moſt conſiderable nations in Abyſſinia, and can bring into the field about 4000 horſe and a great number of foot; but were once much more powerful than they are now, having been greatly reduced by the invaſions of the Galla. Their province is nowhere more than 60 miles in length, or than 30 in breadth; notwithſtanding which they ſupply the capital and all the neighbouring country with cattle, honey, butter, wax, hides, and a number of other neceſſary articles; whence it has been cuſtomary for the Abyſſinian princes to exact a tribute rather than military ſervice from them. The butter is kept from putrefaction during the long carriage, by mixing it with a ſmall quantity of a root ſomewhat like a carrot, which they call *mormoco*. It is of a yellow colour, and anſwers the purpoſe perfectly well; which in that climate it is very doubtful if ſalt could do. The latter is beſides uſed as money; being circulated inſtead of ſilver coin, and uſed as change for gold. Brides paint their feet, hands, and nails, with this root. A large quantity of the ſeed of the plant was brought into Europe by Mr Bruce.

The Agows carry on a conſiderable trade with the Shangalla and other black ſavages in the neighbourhood; exchanging the produce of their country for gold, ivory, horns of the rhinoceros, and ſome fine cotton. The barbarity and thieviſh diſpoſition of both nations, however, render this trade much inferior to what it might be.

In their religion the Agows are groſs idolators, paying divine honours to the Nile, as has already been obſerved. Mr Bruce who lodged in the houſe of the prieſt of the river, had an opportunity of becoming acquainted with many particulars of their devotion. He heard him addreſs a prayer to the Nile, in which he ſtyled it the "Moſt High God, the Saviour of the world. In this prayer he petitioned for ſeaſonable rain, plenty of graſs, and the preſervation of a kind of ſerpents; deprecating thunder very pathetically. The moſt ſublime and lofty titles are given by them to the ſpirit which they ſuppoſe to reſide in the river Nile; calling it everlaſting God, Light of the World, Eye of the World, God of Peace, their Saviour, and Father of the Univerſe.

The Agows are all clothed in hides, which they manufacture in a manner peculiar to themſelves. Theſe hides are made in the form of a ſhirt reaching down to their feet, and tied about the middle with a kind of ſaſh or girdle. The lower part of it reſembles a large double petticoat; one fold of which they turn back over their ſhoulders, faſtening it with a broach or ſkewer acroſs their breaſt before, and the married women carry their children in it behind. The younger ſort generally go naked. The women are marriageable at nine years of age, though they commonly do not marry till eleven; and they continue to bear children till 30, and ſometimes longer. They are generally thin and below the middle ſize, as well as the men. Barrenneſs is quite unknown among them.

The country of the Agows has a very elevated ſituation, and is of courſe ſo temperate that the heat may eaſily be borne, though little more than 10° from the equator. The people, however, are but ſhort lived; which may in part be owing to the oppreſſion they labour under. This, according to Mr Bruce, is exceſſive. "Though their country (ſays he) abounds with all the neceſſaries of life, their taxes, tributes, and ſervices, eſpecially at preſent, are ſo multiplied upon them, whilſt their diſtreſſes of late have been ſo great and frequent, that they are only the manufacturers of the commodities they ſell, to ſatisfy theſe conſtant exorbitant demands, and cannot enjoy any part of their own produce themſelves, but live in penury and miſery ſcarce to be conceived. We ſaw a number of women wrinkled and ſun-burnt ſo as ſcarce to appear human, wandering about under burning ſun, with one and ſometimes two children upon their backs; gathering the ſeeds of bent graſs to make a kind of bread.

NILOMETER, or Niloscope, an inſtrument uſed among the ancients to meaſure the height of the water of the river Nile in its overflowings.

The word comes from Νειλος Nile (and that from νεα ιλυς "new mud," or as ſome others would have it, from νεω, "I flow," and ιλυς, "mud,") and μετρον, "meaſure." The Greeks more ordinarily call it, Νειλοσκοπιον.

The nilometer is ſaid, by ſeveral Arabian writers, to have been firſt ſet up, for this purpoſe, by Joſeph during his regency in Egypt: the meaſure of it was 16 cubits, this being the height of the increaſe of the Nile, which was neceſſary to the fruitfulneſs of Egypt.

From the meaſure of this column, Dr Cumberland * deduces an argument, in order to prove that the Jewiſh and Egyptian cubit were of the ſame length.

In the French king's library is an Arabic treatiſe on nilometers, entitled *Neil fi alnal al Nil;* wherein are deſcribed all the overflowings of the Nile, from the firſt year of the Hegira to the 875th.

Herodotus mentions a column erected in a point of the iſland Delta, to ſerve as a nilometer; and there is ſtill one of the ſame kind in a moſque of the ſame place.

As all the riches of Egypt ariſe from the inundations of the Nile, the inhabitants uſed to ſupplicate them at the hands of their Serapis; and committed the moſt execrable crimes, as actions, forſooth, of religion, to obtain the favour. This occaſioned Conſtantine expreſsly to prohibit theſe ſacrifices, &c. and to order the nilometer to be removed into the church; whereas, till that time, it had been in the temple of Serapis. Julian the Apoſtate had it replaced in the temple, where it continued till the time of Theodoſius the Great.

The only rational and conſiſtent account, however, which we have of the nilometer is given by the celebrated traveller Mr Bruce. "On the point † of the iſland Rhode, between Geeza and Cairo, near the middle of the river, is a round tower encloſing a neat well or ciſtern lined with marble. The bottom of this well is on the ſame level with the bottom of the Nile, which has free acceſs to it through a large opening like an aperture. In the middle of the well riſes a thin column of eight faces of blue and white marble; of which the foot is on the ſame plane with the bottom of the river. This pillar is divided into 20 peeks, of 22 inches each. Of theſe peeks the two lowermoſt are left, without any diviſion, to ſtand for the quantity of ſludge which the water depoſites there. Two peeks are then divided, on the right hand, into 24 digits each; then on the left, four peeks are divided into 24 digits; then on the right, four; and on the left another four: again, four on the right, which completes the number of 18 peeks from the firſt diviſion marked on the pillar, each peek being 22 inches. Thus the whole marked and unmarked amounts to ſomething more than 36 feet Engliſh.

On the night of St John, when, by the falling of the dew, they perceive the rain water from Ethiopia [illegible] with the Nile at Cairo, they begin to announce the elevation of the river, having then five peeks of water marked on the nilometer, and two unmarked for the ſludge, of which they take no notice. Their firſt proclamation, ſuppoſing the Nile to have riſen 12 digits, is 12 from 6, or it wants 12 digits to be ſix peeks. When it has riſen three more, it is nine from ſix; and ſo on, till the whole 18 be filled, when all the land of Egypt is fit for cultivation. Several canals are then opened, which convey the water into the deſert, and hinder any further ſtagnation on the fields. There is indeed a great deal of more water to come from Ethiopia; but were the inundation ſuffered to go on, it would not drain ſoon enough to fit the land for tillage: and to guard againſt this miſchief is the principal uſe of the nilometer, though the Turkiſh government makes it an engine of taxation. From time immemorial the Egyptians paid, as tribute to the king, a certain proportion of the fruit of the ground; and this was anciently aſcertained by the elevation of the water on the nilometer, and by the menſuration of the land actually overflowed. But the Saracen government, and afterwards the Turkiſh, has taxed the people by the elevation alone of the water, without attending to its courſe over the country, or the extent of the land actually overflowed; and this tax is ſometimes cruelly oppreſſive.

NIMBUS, in antiquity, a circle obſerved on certain medals, or round the heads of ſome emperors; anſwering to the circles of light drawn round the images of ſaints.

NIMEGUEN, a large, handſome, and ſtrong town of the Netherlands, and capital of Dutch Guelderland, with a citadel, an ancient palace, and ſeveral forts. It is noted for the peace concluded there in 1679. It has a magnificent town houſe, and the inhabitants are greatly given to trade. It is ſeated on the Vahal or Wahal, between the Rhine and the Maeſe. It is the utmoſt eaſtern boundary of the Netherlands. It contains two Dutch churches, a French Calviniſt and a Lutheran church, five Popiſh, and ſeveral hoſpitals. It was once a Hans-town and an imperial city. It is now the ſeat of government, has a canal to Arnheim, and conſiderable trade to ſome parts of Germany: it trades alſo in fine beer brewing, fattening of cattle, and exporting of its butter, which is extremely good, into all the other provinces. It is in E. Long. 5. 50. N. Lat. 51. 55.

NIMETULAHITES, a kind of Turkiſh monks, ſo called from their founder Nimetulahi, famous for his doctrines and the auſterity of his life.

NIMPO, a city and ſea-port town of China, in the province of Chekiang. It is ſeated on the eaſtern ſea of China, over againſt Japan. It is a city of the firſt rank, and ſtands at the confluence of two ſmall rivers, which, after their union, form a channel that reaches to the ſea, and is deep enough to bear veſſels of 200 tons burden. The walls of Nimpo are 5000 paces in circumference, and are built with freeſtone. There are five gates, beſides two water gates for the paſſage of barks into the city; a tower ſeveral ſtories high, built of bricks; and a long bridge of boats, faſtened together with iron chains, over a very broad canal. This city is commanded by a citadel built on a very high rock, by the foot of which all veſſels muſt neceſſarily paſs. The Chineſe merchants of Siam and Batavia go to this place yearly to buy ſilks, which are the fineſt in the empire. They have alſo a great trade with Japan, it being but two days ſail from hence: thither they carry ſilks, ſtuffs, ſugar, drugs, and wine; and bring back copper, gold, and ſilver. E. Long. 122. 0. N. Lat. 30. 0.

NIMROD, the ſixth ſon of Cuſh, and in all appearance much younger than any of his brothers: for Moſes mentions the ſons of Raamah, his fourth brother, before he ſpeaks of him. What the ſacred hiſtorian ſays of him is ſhort; and yet he ſays more of him than of any other of the poſterity of Noah, till he comes to Abraham. He tells us, that "Nimrod began to be a mighty one in the earth;" that he was

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* *Scripture weights and meaſures,* p. 18.

† *Bruce's Travels.* Vol. III.

a "mighty hunter before the Lord," even to a proverb; and that "the beginning of his kingdom was Babel, and Erech, and Accad, and Calneh, in the land of Shinar."

From this account he is ſuppoſed to have been a man of extraordinary ſtrength and valour. Some repreſent him as a giant; all conſider him as a great warrior. It is generally thought, that by the words *a mighty hunter*, is to be underſtood, that he was a great tyrant; but ſome of the rabbins interpret theſe words favourably, ſaying, that Nimrod was qualified by a peculiar dexterity and ſtrength for the chaſe, and that he offered to God the game which he took; and ſeveral of the moderns are of opinion, that this paſſage is not to be underſtood of his tyrannical oppreſſions, or of hunting of men, but of beaſts. It muſt be owned, that the phraſe *before the Lord* may be taken in a favourable ſenſe, and as a commendation of a perſon's good qualities; but in this place the generality of expoſitors underſtand it otherwiſe.

Hunting muſt have been one of the moſt uſeful employments in the times juſt after the diſperſion, when all countries were over-run with wild beaſts, of which it was neceſſary they ſhould be cleared, in order to make them habitable; and therefore nothing ſeemed more proper to procure a man eſteem and honour in thoſe ages, than his being an expert hunter. By that exerciſe, we are told, the ancient Perſians fitted their kings for war and government; and hunting is ſtill, in many countries, conſidered as one part of a royal education.

There is nothing in the ſhort hiſtory of Nimrod which carries the leaſt air of reproach, except his name, which ſignifies a *rebel*; and that is the circumſtance which ſeems to have occaſioned the injurious opinions which have been entertained of him in all ages. Commentators, being prepoſſeſſed in general that the curſe of Noah fell upon the poſterity of Ham, and finding this prince ſtigmatized by his name, have interpreted every paſſage relating to him to his diſadvantage. They repreſent him as rebel againſt God, in perſuading the deſcendants of Noah to diſobey the divine command to diſperſe, and in ſetting them to build the tower of Babel, with an impious deſign of ſcaling heaven. They brand him as an ambitious uſurper, and an inſolent oppreſſor; and make him the author of the adoration of fire, of idolatrous worſhip given to men, and the firſt perſecutor on the ſcore of religion. On the other hand, ſome account him a virtuous prince, who, far from adviſing the building of Babel, left the country, and went into Aſſyria, becauſe he would not give his conſent to that project.

Nimrod is generally thought to have been the firſt king after the flood; though ſome authors, ſuppoſing a plantation or diſperſion prior to that of Babel, have made kings in ſeveral countries before his time. Mizraim is thought by many who contend for the antiquity of the Egyptian monarchy, to have begun his reign much earlier than Nimrod; and others, from the uniformity of the languages ſpoken in Aſſyria, Babylonia, Syria, and Canaan, affirm thoſe countries to have been peopled before the confuſion of tongues.

The four cities Moſes gives to Nimrod conſtituted a large kingdom in thoſe early times, when few kings had more than one; only it muſt be obſerved, that poſſeſſions might at firſt have been large, and afterwards divided into ſeveral parcels; and Nimrod being the leader of a nation, we may ſuppoſe his ſubjects ſettled within thoſe limits: whether he became poſſeſſed of thoſe cities by conqueſt or otherwiſe, does not appear; it is moſt probable he did not build Babel, all the poſterity of Noah ſeeming to have been equally concerned in that affair; nor does it appear that he built the other three, though the founding of them, and many more, with other works, are attributed to him by ſome authors. It may ſeem alſo a little ſtrange, that Nimrod ſhould be preferred to the regal dignity, and enjoy the moſt cultivated part of the earth then known, rather than any other of the elder chiefs or heads of nations, even of the branch of Ham. Perhaps it was conferred on him for his dexterity in hunting; or, it may be, he did not aſſume the title of king till after his father Cuſh's death, who might have been ſettled there before him, and left him the ſovereignty; but we incline to think, that he ſeized Shinar from the deſcendants of Shem, driving out Aſhur, who from thence went and founded Nineveh, and other cities in Aſſyria.

The Scripture does not inform us when Nimrod began his reign: Some date it before the diſperſion; but ſuch a conjecture does not ſeem to ſuit with the Moſaical hiſtory: for before the diſperſion we read of no city but Babel; nor could there well be more, while all mankind were yet in a body together; but when Nimrod aſſumed the regal title, there ſeem to have been other cities; a circumſtance which ſhews it was a good while after the diſperſion. [illegible] writers of the Univerſal Hiſtory place the [illegible] of his reign 30 years from that event, and in [illegible] lihood it ſhould be placed rather later than earlier.

Authors have taken a great deal of pains to find Nimrod in profane hiſtory: ſome have imagined him to be the ſame with Belus, the founder of the Babyloniſh empire; others take him to be Ninus, the firſt Aſſyrian monarch. Some believe him to have been Evechous, the firſt Chaldean king after the deluge; and others perceive a great reſemblance between him and Bacchus, both in actions and name. Some of the Mahommedan writers ſuppoſe Nimrod to have been Zohak, a Perſian king of the firſt dynaſty: others contend for his being Cay Caus, the ſecond king of the ſecond race; and ſome of the Jews ſay he is the ſame with Amraphel the king of Shinar, mentioned by Moſes. But there is no certainty in theſe conjectures, nor have we any knowledge of his immediate ſucceſſors.

The Scripture mentions nothing as to the death of Nimrod; but authors have taken care that ſuch an eſſential circumſtance in his hiſtory ſhould not be wanting. Some of the rabbins pretend he was ſlain by Eſau, whom they make his contemporary. There is a tradition that he was killed by the fall of the tower of Babel, which was overthrown by tempeſtuous winds. Others ſay, that as he led an army againſt Abraham, God ſent a ſquadron of gnats, which deſtroyed moſt of them; and particularly Nimrod, whoſe brain was pierced by one of thoſe inſects.

NINE, the laſt of the radical numbers or characters, from the combination of which any definite number, however large, may be produced. "It is obſerved by arithmeticians (ſays Hume), that the products of 9 compoſe always either 9 or ſome leſſer products of 9, if you add together all the characters of which any of the former products is compoſed: thus of 18, 27, 36, which are products of 9, you make 9, by adding 1 to 8, 2 to 7, 3 to 6. Thus 369 is a product alſo of 9; and if you add 3, 6, and 9, you make 18, a leſſer product of 9." See *Hume's Dialogues on Nat. Relig.* p. 167, 168, &c. 2d. edit.

NINEVEH (anc. geog.), the capital city of Aſſyria, founded by Aſhur the ſon of Shem (Gen. x. 11.); or, as others read the text, by Nimrod the ſon of Cuſh.

However this be, yet it muſt be owned, that Nineveh was one of the moſt ancient, the moſt famous, the moſt potent, and largeſt cities of the world. It is very difficult exactly to aſſign the time of its foundation; but it cannot be long after the building of Babel. It was ſituated upon the banks of the Tigris; and in the time of the prophet Jonas, who was ſent thither under Jeroboam II. king of Iſrael, and, as Calmet thinks, under the reign of Pul, father of Sardanapalus, king of Aſſyria, Nineveh was a very great city, its circuit being three days journey (Jonah iii. 3.) Diodorus Siculus, who has given us the dimenſions of it, ſays it was 480 ſtadia in circumference, or 47 miles; and that it was ſurrounded with lofty walls and towers; the former being 200 feet in height, and ſo very broad that three chariots might drive on them abreaſt; and the latter 200 feet in height, and 1500 in number; and Strabo allows it to have been much greater than Babylon. Diodorus Siculus was, however, certainly miſtaken, or rather his tranſcribers, as the authors of the Univerſal Hiſtory think, in placing Nineveh on the Euphrates, ſince all hiſtorians as well as geographers who ſpeak of that city, tell us in expreſs terms that it ſtood on the Tigris. At the time of Jonah's miſſion thither, it was ſo populous, that it was reckoned to contain more than ſix ſcore thouſand perſons, who could not diſtinguiſh their right hand from their left (Jonah iv. 11.), which is generally explained of young children that had not yet attained to the uſe of reaſon; ſo that upon this principle it is computed that the inhabitants of Nineveh were then above 600,000 perſons.

Nineveh was taken by Arbaces and Beleſis, in the year of the world 3257, under the reign of Sardanapalus, in the time of Ahaz king of Judah, and about the time of the foundation of Rome. It was taken a ſecond time by Aſtyages and Nabopolaſſar from Chynaladanus king of Aſſyria in the year 3378. After this time, Nineveh no more recovered its former ſplendour. It was ſo entirely ruined in the time of Lucianus Samoſatenſis, who lived under the emperor Adrian, that no footſteps of it could be found, nor ſo much as the place where it ſtood. However, it was rebuilt under the Perſians, and deſtroyed again by the Saracens about the ſeventh age.

Modern travellers ſay (A), that the ruins of ancient Nineveh may ſtill be ſeen on the eaſtern banks of the Tigris, oppoſite to the city Moſul or Mouſul: (See Mousul). Profane hiſtorians tell us, that Ninus firſt founded Nineveh; but the Scripture aſſures us, that it was Aſhur or Nimrod.

The ſacred authors make frequent mention of this city; and Nahum and Zephaniah foretold its ruin in a very particular and pathetic manner.

NINIA, or Ninian, commonly called *St Ninian*, a holy man among the ancient Britons. He reſided at or near a place called by Ptolemy *Lucopibia*, and by Bede *Candida Caſa*; but the Engliſh and Scotch called it *Whitherne*. We mention him, becauſe he is ſaid to have been the firſt who converted the Scots and Picts to the Chriſtian faith; which he did during the reign of Theodoſius the Younger. Bede informs us, that he built a church dedicated to St Martin, in a ſtyle unknown to the Britons of that time; and adds, that during his time the Saxons held this province (*Callovidia*, now *Galloway*), and that, as in conſequence of the labours of this ſaint the converts to Chriſtianity increaſed, an epiſcopal ſee was eſtabliſhed there. Dr Henry, conſidering that "few or none of the writings of the moſt ancient fathers of the Britiſh church are now extant, and ſince little being ſaid of them by their cotemporaries, we can know little of their perſonal hiſtory and of the extent of their erudition," gives a ſhort account of ſome of them. Of St Ninian he ſays, "he was a Briton of noble birth and excellent genius. After he had received as good an education at home as his own country could afford, he travelled for his further improvement, and ſpent ſeveral years at Rome, which was then the chief ſeat of learning as well as of empire. From thence he returned into Britain, and ſpent his life in preaching the goſpel in the moſt uncultivated parts of it, with equal zeal and ſucceſs."

There is a ſmall town called *St Ninian*, about a mile ſouth of Stirling. Its church had been occupied by the rebels in 1745 as a powder magazine; who on their return blew it up in ſuch haſte, as to deſtroy ſome of their own people and about fifteen ſpectators.

NING-PO-FOU, called by the Europeans *Liampo*, is an excellent port, on the eaſtern coaſt of China, oppoſite

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(A) This aſſertion, however, is far from ſeeming probable; for every trace of it ſeems to have ſo totally diſappeared, even ſo early as A. D. 627, that the vacant ſpace afforded a ſpacious field for the celebrated battle between the emperor Heraclius and the Perſians. There are few things in ancient hiſtory which have more puzzled the learned world, than to determine the ſpot where this city ſtood. Mr Ives informs us, that ſome have imagined it ſtood near Jonah's tomb; others, however, place it at another place, ſome hours journey up the Tigris. Theſe different opinions, however, ſeem perfectly reconcilable; for it appears at leaſt probable, that ancient Nineveh took in the whole of the ground which lies between theſe two ruined places. Mr Ives adds, that "what confirms this conjecture is, that much of this ground is now hilly, owing no doubt to the rubbiſh of the ancient buildings. There is one mount of 200 or 300 yards ſquare, which ſtands ſome yards north-eaſt of Jonah's tomb, whereon it is likely a fortification once ſtood. It ſeems to have been made by nature, or perhaps both by nature and art, for ſuch an uſe."

Ninon
||
Nio.

ſite to Japan. Eighteen or twenty leagues from this place is an iſland called *Tcheou-ſhan*, where the Engliſh firſt landed on their arrival at China.

The ſilks manufactured at Ning-po are much eſteemed in foreign countries, eſpecially in Japan, where the Chineſe exchange them for copper, gold, and ſilver. This city has four others under its juriſdiction, beſides a great number of fortreſſes.

NINON L'Enclos, a celebrated lady in the court of France, was of a noble family, and born at Paris in the year 1615; but rendered herſelf famous by her wit and gallantries. Her mother was a lady of exemplary piety; but her father early inſpired her with the love of pleaſure. Having loſt her parents at 14 years of age, and finding herſelf miſtreſs of her own actions, ſhe reſolved never to marry: ſhe had an income of 10,000 livres a-year; and, according to the leſſons ſhe had received from her father, drew up a plan of life and gallantry, which ſhe purſued till her death. Never delicate with reſpect to the number, but always in the choice, of her pleaſures, ſhe ſacrificed nothing to intereſt; but loved only while her taſte for it continued; and had among her admirers the greateſt lords of the court. But though ſhe was light in her amours, ſhe had many virtues.—She was conſtant in her friendſhip, faithful to what are called the *laws of honour*, of ſtrict veracity, diſintereſted, and more particularly remarkable for the exacteſt probity. Women of the moſt reſpectable characters were proud of the honour of having her for their friend; at her houſe was an aſſemblage of every thing moſt agreeable in the city and the court; and mothers were extremely deſirous of ſending their ſons to that ſchool of politeneſs and good taſte, that they might learn ſentiments of honour and probity, and thoſe other virtues that render men amiable in ſociety. But the illuſtrious Madame de Sevigné with great juſtneſs remarks in her letters, that this ſchool was dangerous to religion and the Chriſtian virtues; becauſe Ninon L'Enclos made uſe of ſeducing maxims, capable of depriving the mind of thoſe invaluable treaſures. Ninon was eſteemed beautiful even in old age; and is ſaid to have inſpired violent paſſions at 80. She died at Paris in 1705. This lady had ſeveral children; one of whom, named *Chevalier de Villiers*, occaſioned much diſcourſe by the tragical manner in which he ended his life. He became in love with Ninon, without knowing that ſhe was his mother; and when he diſcovered the ſecret of his birth, ſtabbed himſelf in a fit of deſpair. There have been publiſhed the pretended Letters of Ninon L'Enclos to the Marquis de Sevigné.

NINTH, in muſic. See Interval.

NINUS, the firſt king of the Aſſyrians, was, it is ſaid, the ſon of Belus. It is added, that he enlarged Nineveh and Babylon; conquered Zoroaſter king of the Bactrians; married Semiramis of Aſcalon; ſubdued almoſt all Aſia; and died after a glorious reign of 52 years, about 1150 B. C.; but all theſe facts are uncertain. See Semiramis.

NIO, an iſland of the Archipelago, between Naxi to the north, Armago to the eaſt, Santerino to the ſouth, and Sikino to the weſt, and is about 35 miles in circumference. It is remarkable for nothing but Homer's tomb, which they pretend is in this iſland; for they affirm that he died here in his paſſage from Samos to Athens. The iſland is well cultivated, and not ſo ſteep as the other iſlands, and the wheat which it produces is excellent; but oil and wood are ſcarce. It is ſubject to the Turks. E. Long. 25. 53. N. Lat. 36. 35.

Niobe.

NIOBE, (fab. hiſt.) according to the fictions of the poets was the daughter of Tantalus, and wife of Amphion king of Thebes; by whom ſhe had ſeven ſons and as many daughters. Having become ſo proud of her fertility and high birth, as to prefer herſelf before Latona, and to ſlight the ſacrifices offered up by the Theban matrons to that goddeſs, Apollo and Diana, the children of Latona, reſented this contempt. The former ſlew the male children and the latter the female; upon which Niobe was ſtruck dumb with grief, and remained without ſenſation. Cicero is of opinion, that on this account the poets feigned her to be turned into ſtone.

The ſtory of Niobe is beautifully related in the ſixth book of the Metamorphoſes of Ovid. That poet thus deſcribes her transformation into ſtone.

> Widow'd and childleſs, lamentable ſtate!
> A doleful ſight, among the dead ſhe ſat;
> Harden'd with woes, a ſtatue of deſpair,
> To ev'ry breath of wind unmov'd her hair;
> Her cheek ſtill redd'ning, but its colour dead,
> Faded her eyes, and ſet within her head.
> No more her pliant tongue its motion keeps,
> But ſtands congeal'd within her frozen lips.
> Stagnate and dull, within her purple veins,
> Its current ſtopp'd, the lifeleſs blood remains.
> Her feet their uſual offices refuſe,
> Her arms and neck their graceful geſtures loſe:
> Action and life from every part are gone,
> And ev'n her entrails turn to ſolid ſtone.
> Yet ſtill ſhe weeps; and whirl'd by ſtormy winds,
> Borne thro' the air, her native country finds;
> There fix'd, ſhe ſtands upon a bleaky hill;
> There yet her marble cheeks eternal tears diſtil.

Niobe in this ſtatue is repreſented as in an ecſtacy of grief for the loſs of her offſpring, and about to be converted into ſtone herſelf. She appears as if deprived of all ſenſation by the exceſs of her ſorrow, and incapable either of ſhedding tears or of uttering any lamentations, as has been remarked by Cicero in the third book of his Tuſculan Queſtions. With her right hand ſhe claſps one of her little daughters, who throws herſelf into her boſom; which attitude equally ſhows the ardent affection of the mother, and expreſſes that natural confidence which children have in the protection of a parent. The whole is executed in ſuch a wonderful manner, that this, with the other ſtatues of her children, is reckoned by Pliny among the moſt beautiful works of antiquity: but he doubts to whom of the Grecian artiſts he ought to aſcribe the honour of them (A). We have no certain information at what period

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(A) Par hæſitatio in templo Apollinis Soſiani, Niobem cum liberis morientem, Scopas an Praxiteles fecerit.

riod this celebrated work was transported from Greece to Rome, nor do we know where it was first erected. Flaminius Vacca only says, that all these statues were found in his time not far from the gate of St John, and that they were afterwards placed by the grand duke Ferdinand in the gardens of the Villa de Medici near Rome.—An ingenious and entertaining traveller (Dr Moore), speaking of the statue of Niobe, says, "The author of Niobe has had the judgment not to exhibit all the distress which he might have placed in her countenance. This consummate artist was afraid of disturbing her features too much, knowing full well that the point where he was to expect most sympathy was there, where distress co-operated with beauty, and where *our pity met our love.* Had he sought it one step farther in *expression,* he had lost it."

In the following epigram this statue is ascribed to Praxiteles:

Εκ ζωης με Θεοι θεν σκιλιθον. Εκ δε λιθοιο
Ζωην Πραξιτελης εμπαλιν ειργασατο.

While for my children's fate I vainly mourn'd,
The angry gods to massy stone me turn'd;
Praxiteles a nobler feat has done,
He made me live again from being stone.

The author of this epigram, which is to be found in the 4th book of the *Anthology,* is unknown. Scaliger the father, in his *Farrago Epigrammatum,* p. 172. ascribes it to Callimachus, but this appears to be only conjecture. Cœlius Calcagninus has made a happy [illegible] of it into Latin.

[illegible] in lapidem verterunt numina; sed me
[illegible] vivam reddidit ex lapide.

[illegible] the following French version of it will [illegible] happy:

De vive que j'étois, les Dieux
[illegible] en pierre massive;
Praxitele a fait beaucoup mieux,
De pierre il m'a sçû rendre vive.

NIPHON, the largest of the Japan islands, being 600 miles long and 100 broad. See Japan.

NIPPERS, in the manege, are four teeth in the fore part of a horse's mouth, two in the upper, and two in the lower jaw. A horse puts them forth between the second and third year.

NIPPLES, in Anatomy. See there, N° 112.

NIPPLE-wort, in Botany. See Lapsana.

NISAN, a month of the Hebrews, answering to our March, and which sometimes takes from February or April, according to the course of the moon. It was the first month of the sacred year, at the coming out of Egypt (Exod. xii. 2.), and it was the seventh month of the civil year. By Moses it is called Abib. The name Nisan is only since the time of Ezra, and the return from the captivity of Babylon.

On the first day of this month the Jews fasted for the death of the children of Aaron (Lev. x. 1, 2, 3.) On the tenth day was celebrated a fast for the death of Miriam the sister of Moses; and every one provided himself with a lamb for the passover. On this day the Israelites passed over Jordan under the conduct of Joshua (iv. 19.) On the fourteenth day in the evening they sacrificed the paschal lamb; and the day following, being the [illegible], was held the solemn passover (Exod. xii. 18. &c.) The sixteenth they offered the sheaf of the ears of barley as the first fruits of the harvest of that year (Levit. xxiii. 9. &c.) The twenty-first was the octave of the passover, which was solemnized with particular ceremonies. The twenty-sixth the Jews fasted in memory of the death of Joshua. On this day they began their prayers to obtain the rains of the spring. On the twenty-ninth they called to mind the fall of the walls of Jericho.

NISI prius, in law, a judicial writ which lies in cases where the jury being impannelled and returned before the justices of the bank, one of the parties requests to have such a writ for the ease of the country, in order that the trial may come before the justices in the same county on their coming thither. The purport of a writ of *nisi prius* is, that the sheriff is thereby commanded to bring to Westminster the men impannelled, at a certain day, before the justices, "*nisi prius justiciarii domini regis ad assisas capiendas venerint.*"

NISIBIS (anc. geog.), a city both very ancient, very noble, and of very considerable strength, situated in a district called *Mygdonia,* in the north of Mesopotamia, towards the Tigris, from which it is distant two days journey. Some ascribe its origin to Nimrod, and suppose it to be the *Achad* of Moses. The Macedonians called it *Antiochia of Mygdonia* (Plutarch); situated at the foot of Mount Masius (Strabo). It was the Roman bulwark against the Parthians and Persians. It sustained three memorable sieges against the power of Sapor, A. D. 338, 346, and 350; but the emperor Jovianus, by an ignominious peace, delivered it up to the Persians, A. D. 363.——A colony called *Septimia Nisibitana.*——Another *Nisibis,* of Aria, (Ptolemy), near the lake Arias.

Mr Ives, who passed through this place in 1758, tells us, that "it looked pretty at a distance, being seated on a considerable eminence, at the foot of which runs a river, formerly called the *Mygdonius,* with a stone bridge of eleven arches built over it. Just by the river, at the foot of the hill, or hills (for the town is seated on two), begin the ruins of a once more flourishing place, which reach quite up to the present town. From every part of this place the most delightful prospects would appear, were the soil but properly cultivated and planted; but instead of those extensive woods of fruit trees, which Rawolf speaks of as growing near the town, not above thirty or forty straggling trees of any kind can be perceived; and instead of that great extent of arable land on which he dwells so much, a very inconsiderable number of acres are now remaining. The town itself is despicable, the streets extremely narrow, and the houses, even those which are of stone, are mean. It suffered grievously by the famine of 1757, losing almost all its inhabitants either by death or desertion. The streets presented many miserable objects, who greedily devoured rinds of cucumbers, and every other refuse article of food thrown out into the highway. Here the price of bread had risen near 4000 per cent. within the last 14 years.

NISMES, an ancient, large, and flourishing town of France, in Languedoc, with a bishop's see, and an academy. It has such a number of manufactures of

Nobility.

heirs according to the limitation thereof, though he never himſelf makes uſe of it. Yet it is frequent to call up the eldeſt ſon of a peer to the houſe of lords by writ of ſummons, in the name of his father's barony: becauſe in that caſe there is no danger of his children's loſing the nobility in caſe he never takes his ſeat; for they will ſucceed to their grandfather. Creation by writ has alſo one advantage over that by patent; for a perſon created by writ holds the dignity to him and his heirs, without any words to that purport in the writ; but in letters patent there muſt be words to direct the inheritance, elſe the dignity endures only to the grantee for life. For a man or woman may be created noble for their [illegible] lives, and the dignity not deſcend to their heirs at all, or deſcend only to ſome particular heirs: as where a peerage is limited to a man and the heirs male of his body by Elizabeth his preſent lady, and not to ſuch heirs by any former or future wife.

2. Let us next take a view of a few of the principal incidents attending the nobility,—excluſive of their capacity as members of parliament, and as hereditary counſellors of the crown, for both which we refer to the articles LORDS and PARLIAMENT. And firſt we muſt obſerve, that in criminal caſes a nobleman ſhall be tried by his peers. The great are always obnoxious to popular envy: were they to be judged by the people, they might be in danger from the prejudice of their judges; and would moreover be deprived of the privilege of the meaneſt ſubjects, that of being tried by their equals, which is ſecured to all the realm by magna charta, c. 29. It is ſaid, that this does not extend to biſhops; who, though they are lords of parliament, and ſit there by virtue of their baronies which they hold *jure eccleſiæ*, yet are not ennobled in blood, and conſequently not peers with the nobility. As to peereſſes, no proviſion was made for their trial when accuſed of treaſon or felony, till after Eleanor ducheſs of Glouceſter, wife to the lord protector, had been accuſed of treaſon, and found guilty of witchcraft, in an eccleſiaſtical ſynod, through the intrigues of Cardinal Beaufort. This very extraordinary trial gave occaſion to a ſpecial ſtatute, 20 Hen. VI. c. 9. which enacts, that peereſſes, either in their own right or by marriage, ſhall be tried before the ſame judicature as peers of the realm. If a woman, noble in her own right, marries a commoner, ſhe ſtill remains noble, and ſhall be tried by her peers: but if ſhe be only noble by marriage, then by a ſecond marriage with a commoner ſhe loſes her dignity; for as by marriage it is gained, by marriage it is alſo loſt. Yet if a ducheſs dowager marries a baron, ſhe continues a ducheſs ſtill: for all the nobility are *pares*, and therefore it is no degradation. A peer or peereſs (either in her own right or by marriage) cannot be arreſted in civil caſes: and they have alſo many peculiar privileges annexed to their peerage in the courſe of judicial proceedings. A peer ſitting in judgment, gives not his verdict upon oath, like an ordinary juryman, but upon his honour; he anſwers alſo to bills in chancery upon his honour, and not upon his oath: but, when he is examined as a witneſs either in civil or criminal caſes, he muſt be ſworn; for the reſpect which the law ſhows to the honour of a peer does not extend ſo far as to overturn a ſettled maxim, that *in judicio non creditur niſi juratis*. The honour of peers is however ſo highly tendered by the law, that it is much more penal to ſpread falſe reports of them, and certain other great officers of the realm, than of other men: ſcandal againſt them being called by the peculiar name of *ſcandalum magnatum*, and ſubjected to peculiar puniſhment by divers ancient ſtatutes.

Nobility, Noble.

A peer cannot loſe his nobility but by death or attainder; though there was an inſtance, in the reign of Edward IV. of [illegible] degradation of George Nevile duke of Bedford b[illegible] of parliament, on account of his poverty, which rendered him unable to ſupport his dignity. But this is a ſingular inſtance: which ſerves at the ſame time, by having happened, to ſhow the power of parliament; and, by having happened but once, to ſhow how tender the parliament hath been in exerting ſo high a power. It hath been ſaid indeed, that if a baron waſtes his eſtate, ſo that he is not able to ſupport the degree, the king may degrade him: but it is expreſsly held by later authorities, that a peer cannot be degraded but by act of parliament.

Anton. Matthæus obſerves, that nobility, among the Romans, was a quite different thing from what it is among us. The nobles, among the Romans, were either thoſe raiſed to the magiſtrature, [illegible] deſcended from magiſtrates: there was no ſuch [illegible] as nobility by patent.

Bartoli ſays, that doctors, after they have held a profeſſor's chair in an univerſity for 20 years, become noble; and are entitled to all the rights of counts.

But this claim is not admitted [illegible] court, &c. though Bartoli's ſentiments be backed with thoſe of ſeveral other authors, particularly Chaſſanæus in his *Conſuetudin. Burgundiæ*, *Boyer ſur la Coutume de Berry*; *Faber C. de Dig. Def.* 9. &c. which laſt, however, reſtrains Bartoli's rule to doctors in law, and princes phyſicians.

By an edict of the French king in 1669, it is declared, that trade ſhall not derogate from nobility, provided the perſon do not ſell by retail.

In Bretagne, by ancient cuſtom, a nobleman loſes nothing by trading even in retail: but he reaſſumes all his rights as ſoon as he ceaſes traffic, his nobility having ſlept all the time.

In Germany, a woman, not noble by birth, doth not become, *v. gr.* a counteſs or baroneſs by marrying a count or baron: a lady of the higher degree indeed becomes a princeſs by marrying a prince; but this does not hold of a lady of the lower nobility.

On the coaſt of Malabar, children are only capable of being noble by the mother's ſide; it being allowed them to take as many huſbands as they pleaſe, and to quit them whenever they think good.

NOBLE, *Nobilis*, a perſon who has a privilege which raiſes him above a commoner or peaſant, either by birth, by office, or by patent from his prince. The word comes from the Latin *nobilis*; formed from the ancient *noſcibilis*, "diſtinguiſhable, remarkable."

In England, the word *noble* is of a narower import than in other countries; being confined to perſons above the degree of knights; whereas, abroad, it comprehends not only knights, but what we ſimply call *gentlemen*. The nobles of England are alſo called *pares regni*, as being *nobilitatis pares*, though *gradu impares*.

The Venetian *nobleſſe* is famous: it is in this that the ſovereignty of the ſtate reſides. It is divided into three claſſes. The firſt only comprehends 24 families. The ſecond includes the deſcendants of all thoſe who were entered in the Golden Book, in 1289, and deſtined to govern the ſtate, which then began to be ariſtocratic. The third conſiſts of ſuch as have bought the dignity of noble Venetians. This laſt claſs is only admitted to the inferior employs; the two former to all indifferently. The title of *noble Venetians* is ſometimes alſo given to foreign kings, princes, [illegible]

Nobles, among the Roman[illegible] ſuch as had the *jus imaginum*, or the right of uſing the pictures or ſtatues of their anceſtors; a right which was allowed only to thoſe whoſe anceſtors had borne ſome *curule* office, that is, had been *curule ædile, cenſor, prætor*, or *conſul*. For a long time, none but the *patricii* were the *nobiles*, becauſe no perſon but of that ſuperior rank could bear any *curule* office; hence in Livy, Salluſt, &c. *nobilitas* is uſed to ſignify the patrician order, and ſo oppoſed to *plebs*. To make the true meaning of *nobiles* ſtill more clear, let it be obſerved, that the Roman people were divided into *nobiles, novi*, and *ignobiles*. *Nobiles* were they who had the pictures, &c. of their anceſtors: *novi* were ſuch as had only their own; *ignobiles* were ſuch as had neither. See *Jus Imaginis*.

The Roman nobility, by way of diſtinction, wore a half moon upon their ſhoes, eſpecially thoſe of patrician rank.

The Grecian nobility were called Ευπατρίδαι, as being deſcended from thoſe old heroic anceſtors ſo famous in hiſtory. Such were the *Praxiergidæ, Etrobutidæ, Alcmæonidæ*, &c. all which had many privileges annexed to their quality; amongſt which was this, that they wore graſhoppers in their hair as a badge of nobility.

Noble, a money of account containing ſix ſhillings and eight pence.

The noble was anciently a real coin ſtruck in the reign of Edward III. and then called the *penny of gold*; but it was afterwards called a *roſe-noble*, from its being ſtamped with a roſe: it was current at 6s. 8d.

NOCERA, a town in Italy, in the dominions of the king of Naples and Sicily, or, as he is more commonly called, the king of the Two Sicilies. It is an epiſcopal city, but might with greater propriety be ſtyled a cluſter of villages; its ſeveral parts being extended along the foot of the mountains, form the Città Sotana, or low town; and the biſhop's palace, together with ſome convents embowered in cypreſs groves, cover the peak of a ſingle hill in a very picturesque manner, and compoſe the Città Soprana.

Nocera (A), it is reported, contains near 30,000 inhabitants; they are diſperſed in forty patches of habitation. Their houſes are conſtructed of two kinds of ſtone: the common walls are built with yellow tufa dug out of the hills that lie about a mile to the eaſt of the town; which ſtone ſeems unqueſtionably to have been formed by a conſolidation of ſubſtances thrown out of Veſuvius; becauſe, on opening theſe quarries, the workmen have frequently diſcovered tombs, vaſes, and coins locked up in the body of the ſtony ſtratum. The caſes of their doors and windows are made of a black ſtone drawn from the hill of Fiano, two miles to the north: it lies eight feet below the ſurface, in a bed or vein 140 feet thick, reſting upon a baſe of ſand. This ſeems evidently to be a ſtream of lava congealed.

Nocera is a place of very conſiderable antiquity: in the 13th century is was called de Pagani, to diſtinguiſh it from a city in Umbria of a ſimilar name; this addition was in alluſion to a colony of Saracens which Frederick of Suabia brought from Sicily, and ſettled here, that they might be out of the way of their dangerous connexions with Africa: hence Nocera has often been confounded with Lucera by the negligent or ignorant chroniclers of the ſucceeding ages. The moſt remarkable event that occurs in its hiſtory is the ſiege of its caſtle, A. D. 1384. E. Long. 12. 55. N. Lat. 43. 2.

Terra Noceriana, *Earth of Nocera*, in the materia medica, a ſpecies of bole, remarkably heavy, of a grayiſh-white colour, of an inſipid taſte, and generally with ſome particles in it which grit between the teeth. It is much eſteemed by the Italians as a remedy for venomous bites, and in fevers; but, excepting as an abſorbent and aſtringent, no dependence is to be had on it.

NOCTAMBULI, Noctambulones, or *Night-walkers*; a term of equal import with *ſomnambuli*, applied to perſons who have a habit of riſing and walking about in their ſleep. The word is a compound of the Latin *nox*, "night," and *ambulo*, "I walk."

Schenkius, Horſtius, Clauderus, and Hildanus, who have wrote of ſleep, give us divers unhappy hiſtories of ſuch noctambuli. When the diſeaſe is moderate, the perſons affected with it only repeat the actions of the day on getting out of bed, and go quietly to the places they frequented at other times; but thoſe who have it in the moſt violent degree, go up to dangerous places, and do things which would terrify them to think of when they are awake. Theſe are by ſome called *lunatic* night-walkers, becauſe fits are obſerved to return with the moſt frequency and violence at the changes of the moon.—For the cure ſome recommend purging and a cooling regimen: others are of opinion that the beſt method is to place a veſſel of water at the patient's bedſide in ſuch a manner that he will naturally ſtep into it when he gets out of bed; or if that ſhould fail, a perſon ſhould ſit up to watch and beat him every time it happens. See Sleep-walkers, or Somnambuli.

NOCTILUCA, a ſpecies of phoſphorus, ſo called becauſe it ſhines in the dark without any light being thrown upon it: ſuch is the phoſphorus made of urine.

NOCTURNAL, ſomething relating to the night, in contradiſtinction to diurnal.

Nocturnal, *Nocturlabium*, an inſtrument chiefly uſed at ſea, to take the altitude or depreſſion of ſome ſtars about the pole, in order to find the latitude and hour of the night.

Some nocturnals are hemiſpheres, or planiſpheres,

(A) Anciently, Nuceria Alphaterna, a word of unknown etymology. It was a Roman colony, and had its mint.

Num. Nucerin.

1. Caput virile imberbe—Equus ſtans capite reflexo inter crura. A . . IN . .

on the plane of the equinoctial. Thoſe commonly in uſe among ſeamen are two; the one adapted to the polar ſtar, and the firſt of the guards of the Little Bear; the other to the pole ſtar, and the pointers of the Great Bear.

This inſtrument conſiſts of two circular plates, applied to each other. The greater, which has a handle to hold the inſtrument, is about 2½ inches diameter, and is divided into twelve parts, agreeing to the twelve months; and each month ſubdivided into every fifth day; and ſo as that the middle of the handle correſponds to that day of the year wherein the ſtar here regarded has the ſame right aſcenſion with the ſun. If the inſtrument be fitted for two ſtars, the handle is made moveable. The upper left circle is divided into twenty-four equal parts for the twenty-four hours of the day, and each hour ſubdivided into quarters. Theſe twenty-four hours are noted by twenty-four teeth to be told in the night. Thoſe at the hour 12 are diſtinguiſhed by their length. In the centre of the two circular plates is adjuſted a long index, moveable upon the upper plate; and the three pieces, viz. the two circles and index, are joined by a rivet which is pierced through the centre with a hole, through which the ſtar is to be obſerved. Plate CCCXLVI

To uſe the nocturnal, turn the upper plate till the long tooth, marked 12, be againſt the day of the month on the under plate; then, bringing the inſtrument near the eye, ſuſpend it by the handle with the plane nearly parallel to the equinoctial; and viewing the pole ſtar through the hole of the centre, turn the index about, till, by the edge coming from the centre, you ſee the bright ſtar or guard of the Little Bear, (if the inſtrument be fitted to that ſtar): then that tooth of the upper circle, under the edge of the index, is at the hour of the night on the edge of the hour circle: which may be known without a light, by counting the teeth from the longeſt, which is for the hour 12.

NOD, or the *Land of Nod*. It was to this country that Cain withdrew after his fratricide, (Gen. iv. 16.) The Septuagint, as well as Joſephus, read *Naid* inſtead of *Nod*, and have taken it for the name of a place. It is not eaſily known what country this was, unleſs perhaps it was the country of Nyſe or Nyſea, towards Hyrcania. St Jerome and the Chaldee interpreters have taken the word Nod in the ſenſe of an appellative, for *vagabond* or *fugitive*; "He dwelt a fugitive in the land." But the Hebrew reads, "He dwelt in the land of Nod." (Gen. iv. 16.)

NODAB, a country bordering upon Iturea and Idumæa, but now unknown. We read in the Chronicles, that the tribe of Reuben, aſſiſted by thoſe of Gad and Manaſſeh, had a war againſt the Hagarites, the Jeturites, and the people of Nephiſh, and of Nodab, in which the Iſraelites had the advantage. 1 Chr. v. 19. But the time and the other particulars of this war are unknown.

NODATED HYPERBOLA, a name given by Sir Iſaac Newton to a kind of hyperbola, which, by turning round, decuſſates or croſſes itſelf.

NODDY. See STERNA.

NODE, a tumour ariſing on the bones, and uſually proceeding from ſome venereal cauſe; being much the ſame with what is otherwiſe called *exoſtoſis*.

NODES, in aſtronomy, the two points where the orbit of a planet interſects the ecliptic.

Such are the two points C and D; of which the node C, where the planet aſcends northward above the plane of the ecliptic, is called the *aſcending node*, or the *dragon's head*, and is marked thus ☊. The other node D, where the planet deſcends to the ſouth, is called the *deſcending node*, or the *dragon's tail*, marked thus ☋. Plate CCCXLVI N° 1.

The line C[illegible]herein the two circles CEDF and CGDH inte[illegible] called the *line of nodes*. It appears from ob[illegible]tion, that the line of the nodes of all the planets conſtantly changes its place, and ſhifts its ſituation from eaſt to weſt, contrary to the order of the ſigns; and that the line of the moon's nodes, by a retrograde motion, finiſhes its circulation in the compaſs of 19 years; after which time, either of the nodes having receded from any point of the ecliptic, returns to the ſame again; and when the moon is in the node, ſhe is alſo ſeen in the ecliptic. If the line of nodes were immoveable, that is, if it had no other motion than that whereby it is carried round the ſun, it would always look to the ſame point of the ecliptic, or would keep parallel to itſelf, as the axis of the earth does.

From what hath been ſaid, it is evident, that the moon can never be obſerved preciſely in the ecliptic, but twice in every period; that is, when ſhe enters the nodes. When ſhe is at her greateſt diſtance from the nodes, viz. in the points E, F, ſhe is ſaid to be in her limits.

The moon muſt be in or near one of the nodes, when there is an eclipſe of the ſun or moon.

To make the foregoing account of the motion of the moon's nodes ſtill clearer, let the plane of N° 2. *ibid.* repreſent that of the ecliptic, S the ſun, T the centre of the earth, L the moon in her orbit D N *d n*. N *n* is the line of the nodes paſſing between the quadrature Q and the moon's place L, in her laſt quarter. Let now LP, or any part LS, repreſent the exceſs of the ſun's action at T; and this being reſolved into the force LR, perpendicular to the plane of the moon's orbit, and PR parallel to it, it is the former only that has any effect to alter the poſition of the orbit, and in this it is wholly exerted. Its effect is twofold: 1. It diminiſhes its inclination by a motion which we may conceive as performed round the diameter D *d*, to which L T is perpendicular. 2. Being compounded with the moon's tangential motion at L, it gives it an intermediate direction L *t*, through which and the centre a plane being drawn, muſt meet the ecliptic nearer the conjunction C than before.

NODUS, or node, in dialling, a certain point or pole in the gnomon of a dial, by the ſhadow or light whereof either the hour of the day in dials without furniture, or the parallels of the ſun's declination, and his place in the ecliptic, &c. in dials with furniture, are ſhown. See DIALLING.

NOEOMAGUS LEXUVIORUM, (Ptol.); thought to be the *Civitas Lexoviorum* of the lower age. Now *Liſieux*, a city in Normandy.—Another of the *Tricaſtini*; a town of Gallia Narbonenſis; thought to be *S. Pol. de Trois Châteaux*, ſix miles to the weſt of Nyons in Dauphiné.

NOETIANS, in church hiſtory, Chriſtian heretics in the third century, followers of Noetius, a philoſopher of Epheſus, who pretended that he was another Moſes ſent by God, and that his brother was a new Aaron. His hereſy conſiſted in affirming that there was but one perſon in the Godhead; and that the Word and the Holy Spirit were but external denominations given to God in conſequence of different operations: that, as Creator, he is called *Father*; as Incarnate, *Son*; and as deſcending on the apoſtles, *Holy Ghoſt*.

NOLA, a very ancient city, [illegible] populous and ſtrong, ſituated in a plain to the [illegible] of Veſuvius, in Campania, ſaid to be built [illegible] Chalcidians; (Juſtin, Silius Italicus); according to others, by the Tuſcans. At this place Hannibal met with the firſt check by Marcellus. Veſpaſian added the appellation *Auguſta Colonia*, (Frontinus). At this place, or in its neighbourhood, Auguſtus is ſaid to have expired. It is alſo ſaid that bells were firſt invented there in the beginning of the 5th century; hence their Latin names *Nola* or *Campanæ*. It retains its old name to this day, but it hath vaſtly fallen ſhort of its ancient ſplendour. A town of the kingdom of Naples. E. Long. 15. N. Lat. 41. 5.

NOLANA, in botany: A genus of the monogynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 41ſt order, *Aſperifoliæ*. The corolla is campanulated; the ſtyle ſituated betwixt the germens; the ſeeds are bilocular, and reſemble berries.

NOLLE PROSEQUI, is where a plaintiff in an action does not declare in a reaſonable time; in which caſe it is uſual for the defendant's attorney to enter a rule for the plaintiff to declare, after which a *non proſ.* may be entered. A *nolle proſequi* is eſteemed a voluntary confeſſion, that the plaintiff has no cauſe of action; and therefore if a plaintiff enters his *nolle proſequi*, he ſhall be amerced; and if an informer cauſe the ſame to be entered, the defendant ſhall have coſts.

NOLLET (Jean Antoine), a deacon, licentiate in theology, preceptor to the *Enfans de France* for phyſics and natural hiſtory, regius profeſſor of phyſics in the college of Navarre, member of the Academy of Sciences at Paris, of the Royal Society of London, of the Inſtitution of Bologna, and of the Academy of Sciences of Erfort; was born at Pimbré, in the dioceſe of Noyon, on the 17th of November 1700, of reſpectable but not wealthy parents. To make up the want of riches, they determined to give their ſon a good education. They ſent him to the college of Clermont in Beauvoiſis, and afterwards to Beauvais, there to finiſh his introductory ſtudies. The progreſs which he made in the different claſſes, determined them to ſend him to ſtudy philoſophy at Paris. Thenceforward they intended him for the clerical order; and they conſidered the ſtrictneſs and purity of his morals, together with his unwearied application to ſtudy, as ſufficient proofs of his vocation. The young Nollet yielded without reluctance to the wiſhes of his parents. As ſoon as he was capable of ſhowing an inclination for any thing, he had diſcovered a taſte for phyſics; but this was not become his ruling paſſion; he therefore ſacrificed it to the ſtudy of ſcholaſtic divinity, to which he wholly dedicated himſelf during his time of probation in 1728. No ſooner had he been inveſted with the deaconſhip, than he ſolicited and obtained a licenſe to preach. This new occupation, however, did not make him entirely loſe ſight of thoſe ſtudies which had firſt engaged his attention. They inſenſibly began to occupy a greater portion of his time, which was now more equally divided between theology and the ſciences. The latter, however, prevailed; and thenceforth he entered into the ſtudy of phyſics with an ardour which was only increaſed by that kind of privation to which he had been long ſubject. He was received into the Society of Arts, eſtabliſhed at Paris under the patronage of the late count de Clermont. In 1730, the Abbé Nollet was engaged in a work conjunctly with Reaumur and du Fay of the Academy of Sciences. In 1734, he went to London in company with M. M. du Fay, du Hamel, and de Juſſieu. His merit procured him a place in the Royal Society without any ſolicitation. Two years after, he went to Holland, where he formed an intimate connexion with Deſaguliers, Graveſande, and Muſchenbroeck. On his return to Paris, he reſumed the courſe of experimental phyſics which he had begun in 1735, and which he continued till 1760. Theſe courſes of phyſics firſt ſuggeſted the idea of particular courſes in other branches of ſcience, ſuch as in chemiſtry, anatomy, natural hiſtory, &c. In 1738, the count de Maurepas prevailed on the cardinal Fleury to eſtabliſh a public claſs for experimental phyſics; and the Abbé Nollet was appointed the firſt profeſſor. In the beginning of the year 1739, he was admitted a member of the Royal Academy of Sciences; and in the month of April following, the king of Sardinia intending to eſtabliſh a profeſſorſhip of phyſics at Turin, invited the Abbé Nollet into his dominions. From thence he travelled into Italy. In 1744, he was honoured with an invitation to Verſailles, to inſtruct the dauphin in experimental philoſophy; the king and royal family were often preſent at his lectures. The qualities as well of his underſtanding as of his heart gained him the eſteem and confidence of his pupil. Going one day in ſtate to Paris, he cauſed intimation to be made that he was to dine at the Thuilleries. M. Nollet having gone thither to pay his court, the dauphin no ſooner perceived him, than he had the goodneſs to ſay, "Binet has the advantage of me, he has been at your houſe." Till the period of his death, this prince ſhowed marks of the ſtrongeſt attachment and favour for this ingenious philoſopher. He would have wiſhed that he had been a little more attentive to the improvement of his fortune. He prevailed upon him to go and pay court to a man in power, whoſe patronage might have been of ſervice to him. The Abbé Nollet accordingly waited upon the placemen, and made him a preſent of his works. "I never read any works of that kind," ſaid the patron coldly, and caſting a look at the volumes before him. "Sir (replied the Abbé), will you allow them to remain in your antichamber? There perhaps there may be found men of genius who will read them with pleaſure." In the month of April 1749, he made a grand tour into Italy, being ſent thither for the purpoſe of making obſervations. At Turin, Venice, and Bologna, the Abbé Nollet appeared as a deputy from the philoſophers of the reſt of Europe. During his ſhort ſtay in Italy, the wonders of electricity were not the only object of his reſearches; every part of phyſics, the arts agriculture, &c. came equally under his notice. Upon his return through Turin, the king of Sardinia, always truly ſenſible of his merit, offered him the order of Saint Maurice, which he did not think proper to accept without his ſovereign's permiſſion. In 1753 the king inſtituted a claſs of experimental philoſophy in the royal college of Navarre, and appointed the Abbé Nollet profeſſor. In 1757, he received from the king a brevet appointing him preceptor in phyſics and natural hiſtory to the *Enfans de France*. In the month of Auguſt, the ſame year, he was appointed profeſſor of experimental philoſophy in the ſchool of Artillery, at that time eſtabliſhed at la Fere. In the month of November following, he was admitted as a penſionary of the Royal Academy of Sciences. M. de Cremillo, director general of artillery and fortification, having founded a claſs of experimental philoſophy at Mezieres in 1761, the Abbé Nollet was appointed profeſſor. This celebrated and laborious philoſopher, who has rendered the moſt important ſervices to phyſics by the diſcoveries with which he has enriched every branch of this ſcience, but particularly electricity, died at Paris on the 25th of April 1770, aged 70; much regretted by the literary world, and by his friends, of whom his gentle character and beneficent heart had procured him a great number. He often retired from the gay and ſplendid ſocieties of Paris, to give aſſiſtance to his relations, who were by no means in affluent circumſtances. His works are, 1. Several papers inſerted in the memoirs of the Academy of Sciences; among which one on the Hearing of Fiſhes is particularly valuable. 2. *Leçons de Phyſique Experimentale*, 6 vols. 12mo; a book well compoſed, and uniting pleaſure with inſtruction. 3. *Recueil de Lettres ſur l'Electricité*, 3 vols. 12mo, 1753. 4. *Eſſai ſur l'Electricité des corps*, 1 vol. 12mo. 5. *Recherches ſur les cauſes particulieres des Phenoménes Electriques*, one vol. 12mo. 6. *L'Andes experiences*, 3 vols. 12mo, with figures, 1770.

NOMADES, a name given, in antiquity, to ſeveral nations, whoſe whole occupation was to feed and tend their flocks; and who had no fixed place of abode, but were conſtantly ſhifting, according to the conveniences of paſturage.—The word comes from the Greek νεμω, *paſco*, "I feed."

The moſt celebrated among the Nomades were thoſe of Africa, who inhabited between Africa properly ſo called, to the eaſt, and Mauritania to the weſt. They are alſo called *Numidæ* or *Numidians*.—Salluſt ſays, they were a colony of Perſians brought into Africa with Hercules.

The Nomades of Aſia inhabited the coaſts of the Caſpian ſea. The Nomades of Scythia were the inhabitants of Little Tartary; who ſtill retain the ancient manner of living.

NOMARCHA, in antiquity, the governor or commander of a nome, or nomos.—Egypt was anciently divided into ſeveral regions or quarters, called *nomes*, from the Greek νομος, taken in the ſenſe of a diviſion; and the officer who had the adminiſtration of each *nome* or *nomos*, from the king, was called *nomarcha*, from νομος and αρχη "command."

NOMBRE-DE-DIOS, a town of Mexico, in the province of Darien, a little to the eaſtward of Porto-Bello. It was formerly a famous place; but it is now abandoned, on account of its unhealthy ſituation. W. Long. 78. 35. N. Lat. 9. 45.

NOMBRIL POINT, in heraldry, is the next below the feſs point, or the very centre of the eſcutcheon.

Suppoſing the eſcutcheon divided into two equal parts below the feſs, the firſt of theſe diviſions is the nombril; and the lower the baſe.

NOME, or NAME, in algebra, denotes any quantity with a ſign prefixed or added to it, whereby it is connected wi[illegible] other quantity, upon which the whole becom[illegible]mial, trinomial, or the like. See ALGEBRA.

NOMENCLATOR, in Roman antiquity, was uſually a ſlave who attended upon perſons that ſtood candidates for offices, and prompted or ſuggeſted to them the names of all the citizens they met, that they might court them and call them by their names, which among that people was the higheſt piece of civility.

NOMENCLATORS, among the botanical authors, are thoſe who have employed their labours about ſettling and adjuſting the right names, ſynonymes, and etymologies of names, in regard to the whole vegetable world.

NOMENCLATURE, NOMENCLATURA, a catalogue of ſeveral of the more uſual words in any language, with their ſignifications, compiled in order to facilitate the uſe of ſuch words to thoſe who are to learn the tongue: ſuch are our Latin, Greek, French, &c. Nomenclatures.

The chemical nomenclature has within theſe few years undergone a total change: we have given a table exhibiting theſe new names facing page 598 of Volume IV. At that time we were not convinced of the propriety of the new theory, nor was it poſſible to foreſee that it would ſo ſoon obtain the approbation of the literary world. True philoſophy requires, however, that we ſhould readily change our opinions when we ſee ſufficient grounds, for *to err is human*. In conſequence of Lavoiſier's ſyſtem being now ſo univerſally adopted, it becomes neceſſary for us to explain his principles at more length than was thought proper before. This we think our duty, and it therefore ſhall be our endeavour, in ſome part of the work, to introduce a ſufficient analyſis of this celebrated and now almoſt univerſally adopted ſyſtem.

NOMENEY, a town in Germany, in the duchy of Lorrain, ſituated on the river Seille, 15 miles north of Nancy.

NOMINALS, or NOMINALISTS, a ſect of ſchool philoſophers, the diſciples and followers of Occam, or Ocham, an Engliſh Cordelier, in the 14th century. They were great dealers in words, whence they were vulgarly denominated *Word-ſellers*; but had the denomination of *Nominaliſts*, becauſe, in oppoſition to the *Realiſts*, they maintained, that words, and not things, were the object of dialectics.

This ſect had its firſt riſe towards the end of the 11th century, and pretended to follow Porphyry and Ariſtotle; but it was not till Ocham's time that they bore the name. The chief of this ſect, in the 11th century, was a perſon called *John*, who, on account of his logical ſubtilty, was called the *ſophiſt*; and his principal diſciples were Robert of Paris, Roſcelin of Compiegne, and Arnoul of Laon. At the beginning, the Nominals had the upper hand: but the Realiſts, though greatly divided among themſelves, were ſupported by men of great abilities; ſuch as Albertus Magnus, T. Aquinas, and Duns Scotus. The Nominal ſect became hereby into diſrepute; till William Occam, in the 14th century, again revived it, and filled France and Germany with the flame of diſputation. Having joined the party of the Franciſcan monks, who ſtrenuouſly oppoſed John XXII. that pope himſelf, and his ſucceſſors after him, left no means untried to extirpate the philoſophy of the Nominaliſts, which was deemed highly prejud[illegible] the intereſts of the church: and hence it wa[illegible] in the year 1339, the univerſity of Paris, by [illegible] public edict, ſolemnly condemned and prohibited the philoſophy of Occam, which was that of the Nominaliſts. The conſequence was, that the Nominaliſts flouriſhed more than ever. In the 15th century, the controverſy was continued with more vigour and animoſity than before; and the diſputants were not content with uſing merely the force of eloquence, but had frequently recourſe to more hoſtile and dangerous weapons; and battles were the conſequence of a philoſophical queſtion, which neither ſide underſtood. In moſt places, however, the Realiſts maintained a manifeſt ſuperiority over the Nominaliſts. While the famous Gerſon, and the moſt eminent of his diſciples were living, the Nominaliſts were in high eſteem and credit in the univerſity of Paris. But upon the death of theſe patrons, the face of things was much changed to their diſadvantage. In the year 1473, Louis XI. by the inſtigation of his confeſſor, the biſhop of Avranches, iſſued out a ſevere edict againſt the doctrines of the Nominaliſts, and ordered all their writings to be ſeized and ſecured, that they might not be read by the people: but the ſame monarch mitigated this edict the year following, and permitted ſome of the books of that ſect to be delivered from their confinement. In the year 1481, he not only granted a full liberty to the Nominaliſts and their writings, but alſo reſtored that philoſophical ſect to its former authority and luſtre in the univerſity.

The Nominaliſts were the founders of the univerſity of Leipſic: and there are many yet abroad who pique themſelves on being Nominals.

The Nominals, with the Stoics, admit the formal conceptions or ideas of things, as the ſubject and foundation of univerſality: but to this they add names, which repreſent and ſignify, after the ſame univocal manner, and without any diſtinction, a great variety of ſingle things alike in genus and ſpecies.

Whence it is that they are called *Nominals*; as pretending, that to become learned, it is not enough to have juſt ideas of things, but it is likewiſe required to know the proper names of the genera and ſpecies of things, and to be able to expreſs them clearly and preciſely, without confuſion or ambiguity.

NOMINATIVE, in grammar, the firſt CASE of NOUNS which are declinable.

The ſimple poſition, or laying down of a noun, or name, is called the *nominative caſe*; yet it is not ſo properly a caſe, as the matter or ground whence the other caſes are to be formed, by the ſeveral changes and inflections given to this firſt termination. Its chief uſe is to be placed in diſcourſe before all verbs, as the ſubject of the propoſition or affirmation.

NONA, a city of Dalmatia, remarkable at preſent only for its ruins, which might furniſh abundant materials to gratify the curioſity of antiquaries; but indeed they are ſo buried by repeated devaſtations, to which that unhappy city has been expoſed, that rarely any veſtige of them appears above ground. "I went thither (ſays Fortis in his Travels), in hopes of finding ſomething worthy of notice, but was diſappointed. Nothing is to be ſeen that indicates the grandeur of the Roman times; neither are there any remains of barbarous magnificence, to put one in mind of the ages in which the kings of the Croat Slavi had their reſidence there. It lies on a ſmall iſland, ſurrounded by a harbour, which in former times was capable of receiving large ſhips; but is now become a fetid pool by means of a little muddy river that falls into it, after a courſe of about ſix miles through the rich abandoned fields of that diſtrict. The ancient inhabitants turned this water into another channel, and made it run through the valley of Draſnich into the ſea; and the remains of the bank raiſed by them for that purpoſe are ſtill to be ſeen. Notwithſtanding, however, the depopulation of this diſtrict, and the dreary ſituation of Nona in particular, the new inhabitants have not loſt courage; and animated by the privileges granted to them by the moſt ſerene republic, are endeavouring to bring the population and agriculture once more into a flouriſhing ſtate. Proper drains for the water would not only render that rich territory habitable, but moreover very fertile; and the brackiſh marſh that ſurrounds the walls of Nona is well calculated to ſupply a conſiderable quantity of fiſh, eſpecially eels. The government generouſly granted the inveſtiture to private perſons, who already draw no inconſiderable advantage from the fiſhing; and did they but adopt better methods, they might every year ſalt many thouſands of eels, which would greatly anſwer our internal commerce, and ſave at leaſt a part of the money that goes out of the country for foreign ſalt fiſh. To the left of the city of Nona, the walls of ſome ancient ruinous buildings appear; which probably in ancient times were ſituated on the main land, though now ſurrounded by water. The ſea forms a narrow channel in this place, which is eaſily fordable, and, at low water, the ſmalleſt boat can ſcarcely paſs."

NONAGE, in law, generally ſignifies all the time a perſon continues under the age of 21; but in a ſpecial ſenſe, it is all the time that a perſon is under the age of 14.

NON, CAPE, a promontory on the weſt coaſt of Africa, oppoſite to the Canary iſlands. W. Long. 12. 0. N. Lat. 44. 28.

NONCONFORMISTS, thoſe who refuſe to join the eſtabliſhed worſhip.

Blackſt. Comment.

Nonconformiſts, in England, are of two ſorts. Firſt, Such as abſent themſelves from divine worſhip in the eſtabliſhed church through total irreligion, and attend the ſervice of no other perſuaſion. Theſe, by the ſtat. 1 Eliz. c. 2. 23 Eliz. c. 1. and 3 Jac. I. c. 4. forfeit one ſhilling to the poor every Lord's day they ſo abſent themſelves, and 20l. to the king if they continue ſuch default for a month together. And if they keep any inmate thus irreligiouſly diſpoſed in their houſes, they forfeit 10l. *per* month.

The ſecond ſpecies of nonconformiſts are thoſe who offend through a miſtaken or perverſe zeal. Such

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were eſteemed, by the Engliſh laws enacted ſince the time of the Reformation, to be Papiſts and Proteſtant diſſenters: both of which were ſuppoſed to be equally ſchiſmatics, in not communicating with the national church; with this difference, that the Papiſts divided from it upon material, though erroneous, reaſons; but many of the diſſenters upon matters of indifference, or, in other words, for no reaſon at all. "Yet certainly (ſays Sir William Blackſtone) our anceſtors were miſtaken in their plans of compulſion and intolerance. The ſin of ſchiſm, as ſuch, is by no means the object of temporal coercion and puniſhment. If, through weakneſs of intellect, through miſdirected piety, through perverſeneſs and acerbity of temper, or (which is often the caſe) through a proſpect of ſecular advantage in herding with a party, men quarrel with the eccleſiaſtical eſtabliſhment, the civil magiſtrate has nothing to do with it; unleſs their tenets and practice are ſuch as threaten ruin or diſturbance to the ſtate. He is bound indeed to protect the eſtabliſhed church: and if this can be better effected by admitting none but its genuine members to offices of truſt and emolument, he is certainly at liberty ſo to do; the diſpoſal of offices being matter of favour and diſcretion. But this point being once ſecured, all perſecution for diverſity of opinions, however ridiculous or abſurd they may be, is contrary to every principle of ſound policy and civil freedom. The names and ſubordination of the clergy, the poſture of devotion, the materials and colour of the miniſter's garment, the joining in a known or unknown form of prayer, and other matters of the ſame kind, muſt be left to the option of every man's private judgment.

"With regard therefore to *Proteſtant diſſenters*, although the experience of their turbulent diſpoſition in former times occaſioned ſeveral diſabilities and reſtrictions (which I ſhall not undertake to juſtify) to be laid upon them by abundance of ſtatutes; yet at length the legiſlature, with a true ſpirit of magnanimity, extended that indulgence to theſe ſectaries, which they themſelves, when in power, had held to be countenancing ſchiſm, and denied to the church of England. The penalties are conditionally ſuſpended by the ſtatute 1 W. &. M. ſt. 1. c. 18. "for exempting their Majeſties Proteſtant ſubjects, diſſenting from the church of England, from the penalties of certain laws," commonly called the *toleration act;* which declares, that neither the laws above mentioned, nor the ſtatutes 1 Eliz. c. 2. § 14. 3 Jac. I. c. 4 & 5. nor any other penal laws made againſt Popiſh recuſants (except the teſt acts), ſhall extend to any diſſenters, other than Papiſts and ſuch as deny the Trinity: provided, 1. That they take the oaths of allegiance and ſupremacy, (or make a ſimilar affirmation, being Quakers), and ſubſcribe the declaration againſt Popery. 2. That they repair to ſome congregation certified to and regiſtered in the court of the biſhop or archdeacon, or at the county ſeſſions. 3. That the doors of ſuch meeting houſe ſhall be unlocked, unbarred, and unbolted; in default of which, the perſons meeting there are ſtill liable to all the penalties of the former acts. Diſſenting teachers, in order to be exempted from the penalties of the ſtatutes 13 and 14 Car. II. c. 4. 17 Car II. c. 2. and 22 Car. II. c. 1. are alſo to ſubſcribe the articles of religion mentioned in the ſtatute 13 Eliz. c. 12. (viz. thoſe which only concern the confeſſion of the true Chriſtian faith, and the doctrine of the ſacraments), with an expreſs exception of thoſe relating to the government and powers of the church, and to infant baptiſm. And by ſtatute 10 Ann. c. 2. this toleration is ratified and confirmed; and it is declared, that the ſaid act ſhall at all times be inviolably obſerved for the exempting ſuch Proteſtant diſſenters as are thereby intended from the pains and penalties therein mentioned. T[illegible] though the offence of nonconformity is by [illegible] univerſally abrogated, it is ſuſpended, and [illegible] to exiſt with regard to theſe Proteſtant diſſenters, during their compliance with the conditions impoſed by the act of toleration: and, under theſe conditions, all perſons, who will approve themſelves no Papiſts or oppugners of the Trinity, are left at full liberty to act as their conſciences ſhall direct them in the matter of religious worſhip. And if any perſon ſhall wilfully, maliciouſly, or contemptuouſly diſturb any congregation, aſſembled in any church or permitted meeting houſe, or ſhall miſuſe any preacher or teacher there, he ſhall (by virtue of the ſame ſtatute) be bound over to the ſeſſions of the peace, and forfeit 20l. But by ſtatute 5 Geo. I. c. 4. no mayor or principal magiſtrate muſt appear at any diſſenting meeting with the enſigns of his office, on pain of diſability to hold that or any other office: the legiſlature judging it a matter of propriety, that a mode of worſhip, ſet up in oppoſition to the national, when allowed to be exerciſed in peace, ſhould be exerciſed alſo with decency, gratitude, and humility. Neither doth the act of toleration extend to enervate thoſe clauſes of the ſtatutes 13 & 14 Car. II. c. 4. and 17 Car. II. c. 2. which prohibit (upon pain of fine and impriſonment) all perſons from teaching ſchool, unleſs they be licenſed by the ordinary, and ſubſcribe a declaration of conformity to the liturgy of the church, and reverently frequent divine ſervice *eſtabliſhed* by the laws of this kingdom.

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"As to *Papiſts*, what has been ſaid of the Proteſtant diſſenters would hold equally ſtrong for a general toleration of them; provided their ſeparation was founded only upon difference of opinion in religion, and their principles did not alſo extend to a ſubverſion of the civil government. If once they could be brought to renounce the ſupremacy of the Pope, they might quietly enjoy their ſeven ſacraments; their purgatory, and auricular confeſſion; their worſhip of relicks and images; nay, even their tranſubſtantiation. But while they acknowledge a foreign power, ſuperior to the ſovereignty of the kingdom, they cannot complain if the laws of that kingdom will not treat them upon the footing of good ſubjects.

"The following are the laws that have been enacted againſt the Papiſts; who may be divided into three claſſes, perſons profeſſing Popery, Popiſh recuſants convict, and Popiſh prieſts. 1. Perſons profeſſing the Popiſh religion, beſides the former penalties for not frequenting their pariſh church, are diſabled from taking any lands either by deſcent or purchaſe, after 18 years of age, until they renounce their errors; they muſt at the age of 21 regiſter their eſtates before acquired, and all future conveyances and wills relating to them; they are incapable of preſenting to any advowſon, or granting to any other perſon any avoid-

Nonconformiſts.

Blackſt. Comment.

ance of the ſame; they may not keep or teach any ſchool, under pain of perpetual impriſonment; and, if they willingly ſay or hear maſs, they forfeit the one 200, the other 100 merks, and each ſhall ſuffer a year's impriſonment. Thus much for perſons, who, from the misfortune of family prejudices, or otherwiſe, have conceived an unhappy attachment to the Romiſh church from their infancy, and publicly profeſs its errors. But if any evil induſtry is uſed to rivet theſe errors upon them; if any perſon ſends another abroad to be educated in the Popiſh relig[illegible] to reſide in any religious houſe abroad for that pu[illegible], or contributes to their maintenance when there; both the ſender, the ſent, and the contributor, are diſabled to ſue in law or equity, to be executor or adminiſtrator to any perſon, to take any legacy or deed of gift, and to bear any office in the realm; and ſhall forfeit all their goods and chattels, and likewiſe all their real eſtate for life. And where theſe errors are alſo aggravated by apoſtacy or perverſion; where a perſon is reconciled to the ſee of Rome, or procures others to be reconciled, the offence amounts to high treaſon. 2. Popiſh recuſants, convicted in a court of law of not attending the ſervice of the church of England, are ſubject to the following diſabilities, penalties, and forfeitures, over and above thoſe before mentioned. They are conſidered as perſons excommunicated; they can hold no office or employment: they muſt not keep arms in their houſes, but the ſame may be ſeized by the juſtices of the peace; they may not come within 10 miles of London, on pain of 100l.; they can bring no action at law or ſuit in equity; they are not permitted to travel above five miles from home, unleſs by licenſe, upon pain of forfeiting all their goods; and they may not come to court, under pain of 100l. No marriage or burial of ſuch recuſant, or baptiſm of his child, ſhall be had otherwiſe than by the miniſters of the church of England, under other ſevere penalties. A married woman, when recuſant, ſhall forfeit two thirds of her dower or jointure, may not be executrix or adminiſtratrix to her huſband, nor have any part of his goods; and during the coverture may be kept in priſon, unleſs her huſband redeems her, at the rate of 10l. a month, or the third part of all his lands. And laſtly, as a feme-couvert recuſant may be impriſoned, ſo all others muſt, within three months after conviction, either ſubmit and renounce their errors, or, if required ſo to do by four juſtices, muſt abjure and renounce the realm: and if they do not depart, or if they return without the king's licenſe, they ſhall be guilty of felony, and ſuffer death as felons without benefit of clergy. There is alſo an inferior ſpecies of recuſancy, (refuſing to make the declaration againſt Popery enjoined by ſtatute 30 Car. II. ſt. 2. when tendered by the proper magiſtrate); which, if the party reſides within ten miles of London, makes him an abſolute recuſant convict; or, if at a greater diſtance, ſuſpends him from having any ſeat in parliament, keeping arms in his houſe, or any horſe above the value of 5l. 3. Popiſh prieſts are in a ſtill more dangerous condition. By ſtatute 11 & 12 W. III. c. 4. Popiſh prieſts, or biſhops, celebrating maſs or exerciſing any part of their functions in England, except in the houſes of ambaſſadors, are liable to perpetual impriſonment. And by the ſtatute 27 Eliz. c. 2. any Popiſh prieſt, born in the dominions of the crown of England, who ſhall come over hither from beyond ſea (unleſs driven by ſtreſs of weather and tarrying only a reaſonable time), or ſhall be in England three days without conforming and taking the oaths, is guilty of high treaſon: and all perſons harbouring him are guilty of felony without the benefit of clergy.

Nonconformiſts.

This is a ſhort ſummary of the laws againſt the Papiſts; of which the preſident Monteſquieu obſerves, that they are ſo rigorous, though not profeſſedly of the ſanguinary kind, that they do all the hurt that can poſſibly be done in cold blood. But in anſwer to this, it may be obſerved (what foreigners who only judge from our ſtatute book are not fully appriſed of), that theſe laws are ſeldom exerted to their utmoſt rigour: and indeed, if they were, it would be very difficult to excuſe them. For they are rather to be accounted for from their hiſtory, and the urgency of the times which produced them, than to be approved (upon a cool review) as a ſtanding ſyſtem of law. The reſtleſs machinations of the Jeſuits during the reign of Elizabeth, the turbulence and uneaſineſs of the Papiſts under the new religious eſtabliſhment, and the boldneſs of their hopes and wiſhes for the ſucceſſion of the queen of Scots, obliged the parliament to counteract ſo dangerous a ſpirit by laws of a great, and then perhaps neceſſary, ſeverity. The powder-treaſon, in the ſucceeding reign, ſtruck a panic into James I. which operated in different ways: it occaſioned the enacting of new laws againſt the Papiſts; but deterred him from putting them in execution. The intrigues of Queen Henrietta in the reign of Charles I. the proſpect of a Popiſh ſucceſſor in that of Charles II. the aſſaſſination-plot in the reign of King William, and the avowed claim of a Popiſh pretender to the crown in ſubſequent reigns, will account for the extenſion of theſe penalties at thoſe ſeveral periods of our hiſtory." But now that all juſt fears of a pretender may be ſaid to have vaniſhed, and the power and influence of the pope has become feeble, ridiculous, and deſpicable, not only in Britain, but in almoſt every kingdom of Europe: and as in fact the Britiſh Catholics ſolemnly diſclaim the dangerous principles aſcribed to them *; the Britiſh legiſlature, giving way to that liberality of ſentiment becoming Proteſtants, have lately repealed the moſt rigorous of the above edicts, *viz.* The puniſhment of Popiſh prieſts or Jeſuits who ſhould be found to teach or officiate in the ſervices of that church; which acts were felony in foreigners, and high treaſon in the natives of this kingdom:—The forfeitures of Popiſh heirs, who had received their education abroad; and whoſe eſtates went to the next Proteſtant heir:—The power given to the ſon, or other relation, being a Proteſtant, to take poſſeſſion of the father's or other relation's eſtate, during the life of the real proprietor:—And the debarring Papiſts from the power of acquiring any legal property by purchaſe.—In propoſing the repeal of theſe penalties, it was obſerved, That, beſides that ſome of them had now ceaſed to be neceſſary, others were at all times a diſgrace to humanity. The impriſonment of a Popiſh prieſt for life, only officiating in the ſervices of his religion, was horrible in its nature: And although the mildneſs of government had hitherto ſoftened the rigour of the law in the practice, it was to be remembered that the Roman Catholic prieſts conſtantly lay at the mercy of the baſeſt and moſt abandoned of mankind—of common informers; for on the evidence of any of theſe wretches, the magiſterial and judicial powers were of neceſſity bound to enforce all the ſhameful penalties of the act. Others of theſe penalties held out the moſt powerful temptations for the commiſſion of acts of depravity, at the very thought of which our nature recoils with horror: They ſeemed calculated to looſen all the bands of ſociety; to diſſolve all civil, moral, and religious obligations and duties, to poiſon the ſources of domeſtic felicity, and to annihilate every principle of honour. The encouragement given to children to lay their hands upon the eſtates of their parents, and the reſtriction which debars any man from the honeſt acquiſition of property, need only to be mentioned to excite indignation in an enlightened age.

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* See their loyal Addreſs to the Throne, May 1 1778, as inſerted in the Magazines or Annual Regiſter for that year.

In order the better to ſecure the Engliſh eſtabliſhed church againſt perils from nonconformiſts of all denominations, Infidels, Turks, Jews, Heretics, Papiſts, and Sectaries, there are, however, two bulwarks erected; called the *corporation* and *teſt acts*: By the former of which, no perſon can be legally elected to any office relating to the government of any city or corporation, unleſs, within a twelvemonth before, he has received the ſacrament of the Lord's ſupper according to the rites of the church of England; and he is alſo enjoined to take the oaths of allegiance and ſupremacy at the ſame time that he takes the oath of office: or, in default of either of theſe requiſites, ſuch election ſhall be void. The other, called the *teſt act*, directs all officers civil and military to take the oaths and make the declaration againſt tranſubſtantiation, in any of the king's courts at Weſtminſter, or at the quarter ſeſſions, within ſix kalendar months after their admiſſion; and alſo within the ſame time to receive the ſacrament of the Lord's ſupper, according to the uſage of the church of England, in ſome public church immediately after divine ſervice and ſermon, and to deliver into court a certificate thereof ſigned by the miniſter and church warden, and alſo to prove the ſame by two credible witneſſes; upon forfeiture of 500l. and diſability to hold the ſaid office. And of much the ſame nature with theſe is the ſtatute 7 Jac. I. c. 2. which permits no perſons to be naturalized or reſtored in blood, but ſuch as undergo a like teſt: which teſt having been removed in 1753, in favour of the Jews, was the next ſeſſion of parliament reſtored again with ſome precipitation.

Non-Naturals, in medicine, ſo called, becauſe by their abuſe they become the cauſes of diſeaſes.

Phyſicians have divided the non-naturals into ſix claſſes, viz. the air, meats and drinks, ſleep and watching, motion and reſt, the paſſions of the mind, the retentions and excretions. See Medicine, *paſſim*.

Non Obſtante, *(notwithſtanding)* a clauſe frequent in ſtatutes and letters patent, importing a licenſe from the king to do a thing, which at common law might be lawfully done, but being reſtrained by act of parliament cannot be done without ſuch licenſe.

Non Proſ. See Nolle *Proſequi*.

Non-Suit, ſignifies the dropping of a ſuit or action, or a renouncing thereof by the plaintiff or defendant; which happens moſt commonly upon the diſcovery of ſome error in the plaintiff's proceedings when the cauſe is ſo far proceeded in, that the jury is ready at the bar to deliver in their verdict.

NONES, (nonæ), in the Roman kalendar, the fifth day of the months January, February, April, June, Auguſt, September, November, and December; and the ſeventh of March, May, July, and October. March, May, July, and October, had ſix days in their nones; becauſe theſe alone, in the ancient conſtitution of the year by Numa, [illegible] 31 days a-piece, the reſt having only 29, and F[illegible] 30: but when Cæſar reformed the year, and m[illegible]ther months contain 31 days, he did not allot them ſix days of nones.

NONJURORS, thoſe who refuſed to take the oaths to government, and who were in conſequence under certain incapacities, and liable to certain ſevere penalties. It can ſcarcely be ſaid that there are any nonjurors now in the kingdom; and it is well known that all penalties have been removed both from Papiſts and Proteſtants, formerly of that denomination, as well in Scotland as in England. The members of the Epiſcopal church of Scotland have long been denominated Nonjurors; but perhaps they are now called ſo improperly, as the ground of their difference from the eſtabliſhment is more on account of eccleſiaſtical than political principles.

NONIUS (Peter), in Spaniſh *Nunez*, a learned Portugueſe, and one of the ableſt mathematicians of the 16th century, was born at Alcacer. He was preceptor to Don Henry, King Emmanuel's ſon, and taught the mathematics in the univerſity of Coimbra. He publiſhed the following works, by which he gained great reputation: 1. *De arte navigandi*. 2. *Annotationes in theorias planetarum Purbachii*; which are greatly eſteemed. 3. A treatiſe *De Crepuſculis*. 4. A treatiſe on algebra. It is obſerved in Furetiere's dictionary, that Peter Nonius, in 1530, firſt invented the angles of 45 degrees made in every meridian, and that he called them *rhumbs* in his language, and calculated them by ſpherical triangles. Nonius died in 1577, aged 80.

Nonius, the name which was not many years ago given to the common device for ſubdividing the arcs of quadrants and other aſtronomical inſtruments, from the perſuaſion that it was invented by *Nonius* or *Nunez*, of whom ſome account has been given in the preceding article. The generality of aſtronomers of the preſent age transferring the honour of the invention from *Nunez* to *Peter Vernier*, a native of Franche Comte, have called this method of diviſion by his name. (See Vernier). Mr Adams, however, in his *Geometrical and Geographical Eſſays*, has lately ſhown that Clevius the Jeſuit may diſpute the invention with them both. The truth ſeems to be, that Nunez ſtarted the idea, Clevius improved it, and Vernier carried it to its preſent ſtate of perfection. The method of Nunez, deſcribed in his treatiſe *De Crepuſculis*, printed at Liſbon 1542, conſiſts in deſcribing within the ſame quadrant 45 concentric circles, dividing the outermoſt into 90 equal parts, the next within into 89, the next into 88, &c. till the innermoſt was divided into 46 only. On a quadrant thus divided the plumb line or index muſt croſs one or other of the circles very near a point of diviſion; whence, by computation, the degrees and minutes of the arch might be eaſily aſcertained. This method is alſo deſcribed by Nunez in his treatiſe *De arte atque ratione navigandi*, where he would fain perſuade himſelf, that it was not unknown to Ptolemy. But as the degrees are thus divided very unequally, and as it is very difficult to attain exactneſs in the diviſion, eſpecially when the numbers into which the arches are to be divided are incompoſite (of which there are no leſs than nine), the method of diagonals, firſt publiſhed by Thomas Digges Eſq; in a treatiſe entitled *Al*[illegible]*ale mathematicæ*, printed at London in 1573, an[illegible] to be invented by one Richard Chenſeler, was ſubſtituted in its room. Nonius's method was, however, improved at different times and by different perſons; and it muſt be acknowledged, that if Vernier ſaw either the original or any of the improvements (and there can be little doubt of his having ſeen them all), his merit is only that of having applied to an uſeful practical purpoſe the ſpeculative invention of another perſon.

NONIUS (Marcellus), a grammarian, and Peripatetic philoſopher, born at Tivoli, wrote a treatiſe, entitled *De proprietate ſermonum*. This author is only valuable for his giving fragments of ancient authors that are nowhere elſe to be found. The above treatiſe was printed at Paris in 1614, with notes.

NONNIUS, or NONIUS (Lewis,) a learned phyſician of Antwerp in the 17th century, wrote ſeveral works which are eſteemed; the principal of which are, 1. An excellent treatiſe entitled *Ichthyophagia, ſive de Piſcium eſu*. 2. *Hiſpania*; which is of great uſe in underſtanding the ancient geography of Spain. 3. A commentary on the medals of Greece, and thoſe of Julius Cæſar, Auguſtus, and Tiberius, in folio; it contains Goltzius's two works on the ſame ſubject. 4. A commentary on Goltzius's account of Greece, the Iſlands, &c. 5. Poems, &c.

NONNUS, a Greek poet of the 5th century, and native of Panopilis in Egypt, was the author of an heroic poem in 48 books, entitled *Dionyſiacorum*, and a paraphraſe in verſe of St John's Goſpel, which may ſerve as a commentary upon it.

NONUPLA, in the Italian muſic, denotes a quick time, peculiar to jigs. This ſpecies of time is otherwiſe called *the meaſure of nine times*, which requires two falls of the hand, and one riſe. There are three ſorts of nonupla. 1. *Nonupla di ſemi minime*, or *dupla ſeſquiquarta*, thus marked $\frac{9}{4}$, where nine crotchets are to be in the bar, of which four make a ſemibreve in common time, *i. e.* in the down ſtroke ſix, and but three up: it is uſually beat *adagio*. 2. *Nonupla di crome*, or *ſeſqui ottava*, marked thus $\frac{9}{8}$, wherein nine quavers make a bar inſtead of eight in common time, *i. e.* ſix down and three up: it is beat *preſto*. 3. *Nonupla di ſemi-crome* or *ſuper ſetti partiente nona*, thus diſtinguiſhed $\frac{9}{16}$, in which nine ſemiquavers are contained in a bar, whereof ſixteen are required in common time, ſix down, and three up: it is ordinarily beat *preſtiſſimo*. Beſide theſe, there are two other ſpecies of nonupla, for which ſee TRIPLE.

NOOTKA SOUND, or, as it was called by Captain Cook, *King George's Sound*, lies Lat. 49. 33. W. Long. 153. 12. It is an entrance or ſtrait to a vaſt inland ſea on the weſt coaſt of North America, and is ſaid to reſemble the Baltic or Mediterranean in Europe. Upon the ſea-coaſt the land is tolerably high and level; but within the ſound it riſes into ſteep hills, which have an uniform appearance. The trees of which the woods are compoſed, are the Canadian pine, white cypreſs, and two or three other ſorts of pine. In general, the trees grow here with great vigour, and are of a large ſize. About the rocks and borders of the woods were ſeen ſome ſtrawberry plants, and raſpberry, currant, and gooſeberry buſhes, all in a flouriſhing ſtate. The principal animals ſeen here were racoons, martens, and ſquirrels. Birds are far from being numerous, and thoſe that are to be ſeen are remarkably ſhy, owing perhaps to their being continually haraſſed by the natives, either to eat them, or to become poſſeſſed of their feathers to be worn as ornaments. The quebrantahueſſos, ſhags, and gulls, were ſeen off the coaſt; and the two laſt were alſo frequent in the ſound. Though the variety of fiſh is not very great, yet they are in greater quantities than [illegible]. The principal ſorts are the common herring, a ſilver coloured bream, and another of a brown colour. Captain Cook and Mr King, who viſited this place, conſider it as an excellent ſhelter for ſhips: and in the account of *A Voyage to the Pacific Ocean*, they give ſome directions for ſailing into it. Theſe and other matters of that kind we ſhall not trouble our readers with; and perhaps the generality of them will be better pleaſed with the following extract from Meares's Voyages to the North-weſt Coaſt of America.

"The people of the Nootka nation are, in general, robuſt and well proportioned:—their faces are large and full, their cheeks high and prominent, with ſmall black eyes:—their noſes are broad and flat, their lips thick, and they have generally very fine teeth, and of the moſt brilliant whiteneſs.

"The manner in which the children of Nootka are treated, when young, is not more extraordinary from its ſtrange, and, as it ſhould appear, total inutility, as from its agreement with the cuſtoms of the Chineſe and Tartars, to whom this practice gives theſe people a conſiderable reſemblance. The head of the infant is bound by the mother with a kind of fillet of ſeveral folds, as low down as the eyes, in order to give it a certain form, which, at this tender age, it is capable of receiving. It might be ſuppoſed, that ſuch a tight drawn ligature muſt cauſe conſiderable pain to the child; but we never obſerved that any of the infants, in ſuch a ſtate of preparation for ſugar-loaf heads, ſuffered any viſible pain or inconvenience.

"Though the cuſtom of compreſſing the head in this manner gives them an unpleaſant appearance, by drawing up the eyebrows, and ſometimes producing the diſagreeable effect of ſquinting, as well as of flattening the noſe and diſtending the noſtrils, they are by no means an ill-looking race of people. They have alſo the cuſtom, which is known to prevail in ſo many Indian nations, of plucking out the beard by the roots, on its firſt appearance; and, as it continues to ſprout, to keep it down by the ſame practice. It is one of the domeſtic employments aſſigned to their wives, to watch this appearance of manhood, and to eradicate the hairs as they come forth; which they do in a very dexterous manner with their fingers, and without giving the leaſt pain in the operation.—Some of them, however, though we ſaw but very few of this diſpoſition, when they advance in years and become infirm, ſuffer their beards to grow without interruption. But, notwithſtanding

Nootka Sound.

ſtanding they have ſo great an averſion to the hair of their chin, that of the head is an object of their attentive vanity: it is ſtrong, black, and gloſſy; grows to a conſiderable length; and is either tied in a kind of knot on the top of their heads, or ſuffered to hang down their backs in flowing negligence.

"In their exterior form they have not the ſymmetry or elegance which is found in many other Indian nations.—Their limbs, though ſtout and athletic, are crooked and ill ſhaped; their ſkin, when cleanſed of filth and ochre, is white; and we have ſeen ſome of the women, when in a ſtate of cleanlineſs (which, however, was by no means a common ſight, and obtained with difficulty), who not only poſſeſſed the fair complexion of Europe, but features that would have attracted notice, for their delicacy and beauty, in thoſe parts of the world where the qualities of the human form are beſt underſtood. But theſe examples of beauty are by no means numerous among the women of Nootka, who are calculated rather to diſguſt than to charm an European beholder. Their hair, like that of the men, is black; their eyes are of the ſame colour; and, in exterior appearance, they are not to be immediately diſtinguiſhed from the men. In their characters they are reſerved and chaſte; and examples of looſe and immodeſt conduct were very rare among them. There were women in St George's Sound, whom no offers could tempt to meretricious ſubmiſſions."

All reports concerning Nootka Sound agree in characterizing the inhabitants as "a very inoffenſive race of people."—Inoffenſive, however, as they are, a cuſtom of a very unnatural, and we ſhould imagine cruel, kind prevails among them: for, together with many other articles which they expoſed to ſale to Captain Cook's ſhips, they brought human ſkulls and hands (part of the fleſh ſtill remaining on them), which they acknowledged they had been feeding on; and ſome of them, we are told, had evident marks of the fire.

From hence it is too apparent, that the horrid practice of devouring their enemies exiſts here as well as at New Zealand and other South ſea iſlands: and hence, too, appears what men of even the beſt natural diſpoſitions will be, if left entirely to the freedom of their own will, without law to controul or religion to inſtruct them. As there are but two villages of the Sound inhabited, the number of people cannot be many; perhaps they are about 2000 in all. Our limits prevent us from being ſo minute as we could wiſh to be, reſpecting the form of their houſes and their manner of building them; of their furniture, decorations, and other things of that kind: we can therefore only refer thoſe who wiſh for further information on this ſubject to Cook, and other voyagers and travellers, &c.

The employment of the men is chiefly fiſhing, &c. whilſt the women manufacture their garments. Their ingenuity in this and in the mechanic arts is far from being inconſiderable; and in the imitative arts their ſkill is very great. On theſe ſubjects, however, we cannot enlarge: we have in general made it our buſineſs, and it certainly is our duty, to dwell, where it can be done, on the manners or religion of the inhabitants of the ſeveral places which come under our notice; and they who know the utility of this in developing the philoſophy of the human mind, the moſt important of all ſciences, will not blame our intentions, even if they ſhould not approve of the execution. In Cook's Voyages before referred to, we find the following obſervations on the religion and language of the inhabitants of Nootka Sound.

"Little knowledge we can be ſuppoſed to have acquired of the political and religious inſtitutions eſtabliſhed among theſe people. We diſcovered, however, that there were ſuch men as chiefs, diſtinguiſhed by the title of *Acw*[illegible] whom the others are, in ſome degree, ſubord[illegible] But the authority of each of theſe great me[illegible]ms to extend no farther than to his own family, who acknowledge him as their head. As they were not all elderly men, it is poſſible this title may be hereditary.

"Nothing that we ſaw could give us any inſight into their notions of religion, except the figures already mentioned, called *Klumma*. Theſe, perhaps, were idols; but as the word *acweek* was frequently mentioned when they ſpoke of them, we may ſuppoſe them to be the images of ſome of their anceſtors, whoſe memories they venerate. This, however, is all conjecture; for we could receive no information concerning them; knowing little more of their language than to enable us to aſk the names of things, and being incapable of holding any converſation with the natives relative to their traditions or their inſtitutions.

"Their language is neither harſh nor diſagreeable, farther than proceeds from their pronouncing the *k* and *h* with leſs ſoftneſs than we do. As to the compoſition of their language, we are enabled to ſay but little. It may, however, be inferred from their ſlow and diſtinct method of ſpeaking, that it has few prepoſitions or conjunctions, and is deſtitute of even a ſingle interjection to expreſs ſurpriſe or admiration. The affinity it may bear to other languages, we have not been able ſufficiently to trace, not having proper ſpecimens to compare it with; but from the few Mexican words we have procured, there is an obvious agreement throughout the language, in the fre[illegible] terminations of the words in *l*, *tl*, or *z*.

"The word *wakaſh* was frequently in the mouths of the people of Nootka. It ſeemed to expreſs approbation, applauſe, and friendſhip. Whenever they appeared to be pleaſed or ſatisfied at any ſight or occurrence, they would call out *wakaſh! wakaſh!*—It is worthy of remark, that as theſe people do eſſentially differ from the natives of the iſlands in the Pacific ocean, in their perſons, cuſtoms, and language, we cannot ſuppoſe their reſpective progenitors to have belonged to the ſame tribe, when they emigrated into thoſe places where we now find their deſcendants."

We cannot finiſh this article without taking notice of a circumſtance, which at the time made a great noiſe in Europe, and which it is probable will find a place in the future hiſtories of the contending countries.

A ſmall aſſociation of Britiſh merchants reſident in the Eaſt Indies had, early in the year 1786, formed the project of opening a trade to this part of the world, for the purpoſe of ſupplying the Chineſe market with furs. The principal point towards which theſe expeditions were directed, was Port Nootka, or King George's Sound; and the adventurers, being in ſome degree ſatisfied with their traffic, took meaſures, in the year 1788, to ſecure to themſelves a permanent ſettlement; at the ſame time that the ſhipping employed in this expedition was generally two, and never exceeded the amount of four, ſmall veſſels. The Spaniards conceived ſome jealouſy of the intruſion of the Engliſh into a part of the world which they had long been deſirous to regard as their excluſive property; and accordingly a Spaniſh frigate of 26 guns was deſpatched from the province of Mexico, for the purpoſe of putting an end to this comm[illegible]. The Spaniſh frigate arrived in May 1789, and [illegible]red two Engliſh veſſels in the following July, [illegible] ſame time taking poſſeſſion of the little ſettlement which had been formed upon the coaſt. Such, in ſhort, is the circumſtance which was likely to involve us in an expenſive war. Happily, however, for both countries, and perhaps for Europe, the matter was at length, after great altercation, amicably ſettled; and it muſt ſtill be ſo freſh in the memories of our readers, that we truſt they will excuſe us from enlarging further upon it—the whole article having extended perhaps to more than a ſufficient length.

NOPAL, RAQUETTE, or *Indian fig*; plants ſo named by the Indians from which the cochineal is collected in Mexico. Theſe plants bear fruits which reſemble our figs; tinge the urine of thoſe who eat them; and probably communicate to the cochineal the property which makes it uſeful to the dyer. The Indians of Mexico cultivate the nopal near their habitations, and ſow, as it were, the inſect which affords the cochineal. They make ſmall neſts of moſs or fine herbs; put twelve or fourteen cochineals into each neſt; place three or four of theſe neſts on each leaf of the nopal; and faſten them there by the prickles of the plant. In the courſe of a few days, thouſands of ſmall inſects iſſue out, and fix themſelves upon the parts of the leaf which are beſt ſheltered and afford the moſt nouriſhment. The cochineals are collected ſeveral times in the courſe of the year; and are deprived of life by ſcalding them, or by putting them into an oven. See COCHINEAL.

Plate CCCXLVI NOPALXOCHQUETZALLI, or NOPALCOCHQUETZALLI, the prickly pear of Mexico, and common over all the Weſt Indies. See CACTUS.

NOPH. See MEMPHIS.

NORBURY, a town in England, in Staffordſhire, on the ſouth-weſt ſide of Eccleſhall. Here is a ſurpriſing echo, which, taken 440 yards north-eaſt from the manor houſe, near a little bank under a wood ſide, repeats in a ſtill day 10 or 11 ſyllables very diſtinctly, or 12 or 13, if ſpoke very quick. It is remarked that the banks of the Black Meer, in this pariſh, grow forward every year over the ſurface of the water, at the rate of three or four yards every ſeven years.

NORDEN (Frederic Lewis), an ingenious traveller and naval officer in the Daniſh ſervice, was born at Gluckſtadt in Holſtein in the year 1708. He was well ſkilled in mathematics, ſhip building, and eſpecially in architecture; and in 1732 obtained a penſion to enable him to travel for the purpoſe of ſtudying the conſtruction of ſhips, particularly the galleys and other rowing veſſels uſed in the Mediterranean. He ſpent near three years in Italy; and Chriſtian VI. being deſirous of obtaining a circumſtantial account of Egypt, Mr Norden at Florence received an order to extend his travels to that country. How he acquitted himſelf in this commiſſion, appears from his Travels into Egypt and Nubia, printed at Copenhagen in folio, 1756; and which were ſoon after tranſlated into Engliſh by Dr Peter Templeman. In the war between England and Spain, Mr Norden, then a captain in the Daniſh navy, attended Count Ulric Adolphus, a ſea captain, to England; and they went out volunteers under Sir John Norris, and afterwards under Sir Chaloner Ogle. During his ſtay in London, Mr Norden was made a fellow of the Royal Society, and gave the public drawings of ſome ruins and coloſſal ſtatues at Thebes in Egypt, with an account of the ſame in a letter to the Royal Society, 1741. His health at this time was declining; and taking a tour to France, he died at Paris in 1742.

NORDHEIM, a town in Germany, in the Hanover quarter. Of the four larger towns of this principality, it is the third in order. It is ſituated on the Ruhme, which runs into the Leine. It contains 500 houſes, and, beſides a ſecularized Lutheran abbey, has one pariſh church, and ſome charitable foundations, and alſo enjoys ſome manufactures.

NORES (Jaſon de), a ſcholar, poet, and philoſopher, was born at Nicoſia in Cyprus. He loſt his fortune when the Turks made themſelves maſters of that iſland in 1570. He retired to Padua; where he acquired great reputation by teaching moral philoſophy. His character had that caſt of ſeverity which is often the conſequence of ſcholaſtic habits. He was one of thoſe men who diſcuſs every thing without being capable of feeling any thing. The *Paſtor Fido* of Gaurini made its appearance; and paſtorals became a faſhionable ſpecies of reading throughout all Itally. Nores, who did not reliſh works of this kind, attacked the production of Guarini; who entirely confuted him in a little piece printed at Ferrara in 1588. Nores made a reply two years after; and the poet was preparing an anſwer ſtill more ſevere than the former, when his antagoniſt died of grief occaſioned by the baniſhment of his only ſon for having killed a Venetian in a duel. He left behind him a great many works, ſome in Italian, and others in Latin. The chief of his Italian works, are, 1. The Poeticks, Padua, 1588, 4to; this edition is rare. 2. A Treatiſe on Republics, 1578, 4to; which he forms on the model of that of the Venetians, his maſters. 3. A Treatiſe on the World and its Parts, Venice, 1571, 8vo. 4. Introduction to three books of Ariſtotle's Rhetoric, Venice, 1584, 4to, valuable. 5. A Treatiſe on what Comedy, Tragedy, and Epic Poetry, may receive from Moral Philoſophy. His Latin works are, 1. *Inſtitutio in Philoſophiam Ciceronis*, Padua, 1576, 8vo. 2. *Brevis et diſtincta ſumma præceptorum de arte diſcendi, ex libris Ciceronis collecta*, Venice, 1553, 8vo; a good work. 3. *De Conſtitutione partium humanæ et civilis philoſophiæ*, 4to. 4. *Interpretatio in artem poeticam Horatii*, &c. In all his works we remark great perſpicuity and accuracy, profound erudition, happy expreſſions, an elevated and ſometimes forcible ſtyle.—His ſon Peter Nores, ſucceſſively ſecretary to ſeveral cardinals, at once a man of letters and a man of buſineſs, left behind him different manuſcripts; among others, the life of Paul IV. in Italian.

NORFOLK, a county of England, ſo called from

Norfolk.

its northen ſituation in reſpect of Suffolk, is bounded on the eaſt and north by the German ocean; on the ſouth by Suffolk, from which it is parted by the rivers Waveney, and the Leſſer Ouſe; and on the weſt it is ſeparated from Cambridgeſhire by the Greater Ouſe, and from a ſmall part of Lincolnſhire by the Waſhes. According to Templeman, it extends in length 57 miles, in breadth 35, and 140 in circumference. It contains an area of 1426 ſquare miles, one city, 32 market towns, 711 villages, according to the book of rates, though ſome make them 1500, and 236,000 inhabitants, as ſome have it, and 283,000, according to others. It is divided into 31 hundreds, 164 vicarages, and 660 pariſhes.

The air differs in different parts of the county according to the ſoil, which in ſome places is marſhy, eſpecially on the ſea coaſt, and there the air is foggy and unwholeſome; in others it is clayey and chalky, poor, lean, and ſandy, and there the air is good. The county is almoſt all champaign, except in ſome places, where riſe gentle hills. The marſh lands yield rich paſture for cattle; the clay grounds peaſe, rye, and barley; and the ſandy heaths feed vaſt flocks of large ſheep, of which ſome villages are ſaid to keep 4000 or 5000. Theſe heaths abound alſo in rabbits of a ſilver gray colour. Walſingham is noted for producing the beſt ſaffron. Great quantities of mackarel and herring are caught upon the coaſts of this county, the former in the ſpring, and the latter in September; eſpecially at Yarmouth, where they are cured in a particular manner, and to great perfection. Wood and honey are alſo very plentiful in this county; and on the coaſts jet and ambergreaſe are ſometimes found. The inhabitants are generally ſtrong and active, ſagacious and acute. That they are ſo robuſt, is the more to be wondered at, becauſe the common people live much on puddings, *Norfolk dumplings*. They are for the moſt part in eaſy circumſtances, and were formerly very quarrelſome and litigious. In conſequence of this diſpoſition, lawyers ſwarmed among them to ſuch a degree, that a ſtatute was made ſo early as the reign of Henry VI. to reſtrain their number. The manufactures of the county, which is exceedingly populous, are chiefly woollen and worſted ſtuffs and ſtockings, for which they are well ſupplied with wool from the vaſt flocks of ſheep bred in it. It gives title of duke to the elder branch of the family of Howard, lies in the dioceſe of Norwich, and ſends twelve members to parliament, viz. two knights for the ſhire, two citizens for Norwich, and two burgeſſes for each of the boroughs of Lynn Regis, Great Yarmouth, Thetford, and Caſtleriſing.

The county is well watered, and ſupplied with fiſh by the rivers Yare, Thyrn, Waveney, the Greater and Leſſer Ouſe, and the Bure, beſides rivulets. The Bure abounds in excellent perch, and the Yare has a fiſh peculiar to it called the *ruffe*. The latter riſes about the middle of the county; and after being joined by the Waveney and Bure, falls into the ſea at Yarmouth. At the equinoxes, eſpecially the autumnal, the Ouſe is ſubject to great inundation, being forced back by the ſea, that enters it with great fury. This county was famous at a very early period for its fiſheries, which were extenſive and valuable, and ſeem to have been carried on with ſpirit. It has alſo been remarkable, for at leaſt 400 years paſt, for the manufacture of fine worſted ſtuffs.

Norfolk, Norfolk Iſland

Norfolk, a county of Virginia contiguous to North Carolina.

Norfolk Iſland, a pretty little iſland of the South ſea, lying in 29° 12′ 30″ ſouth latitude, and 168° 16′ eaſt longitude. A colony was lately ſettled on it: and the following account of it is given in *Governor Phillip's Voyage to Botany Bay*, &c.

"Norfolk Iſland is about ſeven leagues in circumference; and [illegible] originally formed, like many other ſmall iſlands, [illegible] eruption of volcanic matter from the bed of the ſea, muſt doubtleſs have contained a volcano. This concluſion is formed from the vaſt quantity of pumice ſtone which is ſcattered in all parts of it, and mixed with the ſoil. The crater, or at leaſt ſome traces of its former exiſtence, will probably be found at the ſummit of a ſmall mountain, which riſes near the middle of the iſland. To this mountain the commandant has given the name of *Mount Pitt*. The iſland is exceedingly well watered. At or near Mount Pitt riſes a ſtrong and copious ſtream, which flowing through a very fine valley, divides itſelf into ſeveral branches, each of which retains ſufficient force to be uſed in turning mills; and in various parts of the iſland ſprings have been diſcovered.

"The climate is pure, ſalubrious, and delightful, preſerved from oppreſſive heats by conſtant breezes from the ſea, and of ſo mild a temperature throughout the winter, that vegetation continues there without interruption, one crop ſucceeding another. Refreſhing ſhowers from time to time maintain perpetual verdure: not indeed of graſs, for none has yet been ſeen upon the iſland: but of the trees, ſhrubs, and other vegetables, which in all parts grow abundantly. On the leaves of theſe, and of ſome kinds in particular, the ſheep, hogs, and goats, not only live, but thrive and fatten very much. To the ſalubrity of the air every individual in this little colony can bear ample teſtimony, from the uninterrupted ſtate of good health which has been in general enjoyed.

"When our ſettlers landed, there was not a ſingle acre clear of wood in the iſland, and the trees were ſo bound together by that kind of creeping ſhrub called *ſupple jack*, interwoven in all directions, as to render it very difficult to penetrate far among them. The commandant, ſmall as his numbers were at firſt, by indefatigable activity ſoon cauſed a ſpace to be cleared ſufficient for the requiſite accommodations, and for the production of eſculent vegetables of all kinds in the greateſt abundance. When the laſt accounts arrived, three acres of barley were in a very thriving ſtate, and ground was prepared to receive rice and Indian corn. In the wheat there had been a diſappointment, the grain that was ſown having been ſo much injured by the weevil as to be unfit for vegetation. But the people were all at that time in commodious houſes; and, according to the declarations of M. King himſelf, in his letters to Governor Phillip, there was not a doubt that this colony would be in a ſituation to ſupport itſelf entirely without aſſiſtance in leſs than four years; and with very little in the intermediate time. Even two years would be more than ſufficient for this purpoſe, could a proper ſupply of black cattle be ſent.

"Fiſh are caught in great plenty, and in the proper ſeaſon very fine turtle. The woods are inhabited by innumerable tribes of birds, many of them very gay in plumage. The moſt uſeful are pigeons, which are very numerous; and a bird not unlike the Guinea fowl, except in colour (being chiefly white), both of which were at firſt ſo tame as to ſuffer themſelves to be taken by hand. Of plants that afford vegetables for the table, the chief are cabbage palm, the wild plantain, the fern tree, a kind of [illegible] ſpinage, and a tree which produces a diminutive [illegible] bearing ſome reſemblance to a currant. This, it is hoped, by tranſplanting and care, will be much improved in ſize and flavour.

"But the productions which give the greateſt importance to Norfolk Iſland are the pines and the flax plant; the former riſing to a ſize and perfection unknown in other places, and promiſing the moſt valuable ſupply of maſts and ſpars for our navy in the Eaſt Indies; the latter not leſs eſtimable for the purpoſes of making ſail cloth, cordage, and even the fineſt manufactures, growing in great plenty, and with ſuch luxuriance as to attain the height of eight feet. The pines meaſure frequently 160, or even 180 feet in height, and are ſometimes 9 or 10 feet in diameter at the bottom of the trunk. They riſe to about 80 feet without a branch: the wood is ſaid to be of the beſt quality, almoſt as light as that of the beſt Norway maſts; and the turpentine obtained from it is remarkable for purity and whiteneſs. The fern tree is found alſo of a great height for its ſpecies, meaſuring from 70 to 80 feet, and affords excellent food for the ſheep and other ſmall cattle. A plant producing pepper, and ſuppoſed to be the true oriental pepper, has been diſcovered lately in the iſland, growing in great plenty; and ſpecimens have been ſent to England in order to aſcertain this important point."

NORFOLK Sound, according to the account of Captain George Dixon, is ſituated in 57° 3′ north latitude, and 135° 36′ weſt longitude. It is a very extenſive place, but how far it ſtretches to the northward is not known. There may poſſibly be a paſſage through to the Bay of Iſlands, but neither is this certain. The ſhore, in common with the reſt of the coaſt, abounds with pines; there are alſo great quantities of the witch hazel. There are various kinds of flowering trees and ſhrubs, wild gooſberries, currants, and raſpberries; wild parſley is found here in great plenty, and it eats excellently either as a ſalad or boiled amongſt ſoup. The ſaranne, or wild lily root, grows alſo in great plenty and perfection. There are a very few wild geeſe or ducks ſeen here, but they are ſhy and difficult of approach.

NORHAM, a town in England, in the county of Northumberland, on the river Tweed, near the mouth of the Till, under the caſtle, which was anciently erected on a ſteep rock moated round, for the better ſecurity againſt the incurſions of the Scotch moſs troopers. It is of great antiquity; and its old church has lately received repairs, and been made a decent place of worſhip. Antiquities have been diſcovered here. The church had the privilege of a ſanctuary. The caſtle has been frequently honoured with the preſence of ſovereigns, particularly Edward I. here received the oath of fealty from John Baliol of Scotland. It has been a formidable ſtructure, a great part of which is in ruins; the ſite of which, with its demeſnes, conſiſted of 1030 acres.

NORIA, a hydraulic machine much uſed in Spain. It conſiſts of a vertical wheel of 20 feet diameter, on the circumference of which are fixed a number of little boxes or ſquare buckets, for the purpoſe of raiſing the water out of the well, communicating with the canal below, and to empty it into a reſervoir above, placed by the ſide of the wheel. The buckets have a lateral orifice to receive and to diſcharge the water. The axis of this wheel is embraced by four ſmall beams, croſſing each other at right angles, tapering at the extremities, and forming eight little arms. This wheel is near the centre of the horſe walk, contiguous to the vertical axis, into the top of which the horſe beam is fixed: but near the bottom it is embraced by four little beams, forming eight arms ſimilar to thoſe above deſcribed, on the axis of the water wheel. As the mule which they uſe goes round, theſe horizontal arms, ſupplying the place of cogs, take hold, each in ſucceſſion, of thoſe arms which are fixed on the axis of the water wheel, and keep it in rotation.

This machine, than which nothing can be cheaper, throws up a great quantity of water; yet undoubtedly it has two defects: the firſt is, that part of the water runs out of the buckets and falls back into the well after it has been raiſed nearly to the level of the reſervoir: the ſecond is, that a conſiderable proportion of the water to be diſcharged is raiſed higher than the reſervoir, and falls into it only at the moment when the bucket is at the higheſt point of the circle, and ready to deſcend.

Both theſe defects might be remedied with eaſe, by leaving theſe ſquare buckets open at one end, making them ſwing on a pivot fixed a little above their centre of gravity, and placing the trough of the reſervoir in ſuch a poſition as to ſtop their progreſs whilſt perpendicular; make them turn upon their pivot, and ſo diſcharge their contents.

From the reſervoir the water is conveyed by channels to every part of the garden; theſe have diviſions and ſubdiviſions or beds, ſome large, others very ſmall, ſeparated from each other by little channels, into which a boy with his ſhovel or his hoe directs the water, firſt into the moſt diſtant trenches, and ſucceſſively to all the reſt, till all the beds and trenches have been either covered or filled with water.

Mr Townſend, from whom we have taken the above account, thinks, that on account of the extreme ſimplicity of this machine, it is an invention of the moſt remote antiquity. By means of it the inhabitants every morning draw as much water from the well as will ſerve through the day, and in the evening diſtribute it to every quarter according to the nature of their crops. The reſervoirs into which they raiſe the water are about 20, 30, or even 40 feet ſquare, and three feet high above the ſurface of the ground, with a ſtone cope on the wall, declining to the water for the women to waſh and beat their clothes upon.

Our limits preclude us from following Mr Townſend farther in the deſcription of a particular noria uſed at Barcelona; which he conceives to be the original chain pump, or at leaſt its parent. He compares it with ſimilar inſtruments, and ſhows its advantages and diſadvantages.

NORICUM (Ptolemy, Tacitus); a Roman province, ſituated between the Danube on the north, and thus ſeparated from ancient Germany; the Alpes Noricæ on the ſouth; the river Ænus on the weſt, which ſeparates it from Vindelicia; and Mons Cetius on the eaſt, which divides it from Pannonia. Now containing a great part of Auſtria, all Saltzburg, Stiria, and Carinthia. It was anciently a kingdom under its own kings (Cæſar, Velleius, Suetonius). *Norici* the people, ſubdued by Tiberius under Auguſtus, as allies of the Pannonii (Dio, Velleius). Tacitus reckons Noricum among thoſe provinces which were governed by procurators, officers ſent by the emperors to receive and diſpoſe of the public revenue according to order. It was divided into two provinces, but at what time uncertain; ſuppoſed as low down as Diocleſian and Conſtantine, *viz.* the *Noricum Ripenſe*, running along the ſouth ſide of the Danube; and the *Noricum Mediterraneum*, extending towards the Alps. How far each of theſe extended in breadth does not appear: all the account we have of the matter being from Sextus Rufus, and the *Notitia Imperii Occidentalis*. Anciently a country famous for its iron and ſteel (Horace); as is Stiria at this day, a part of Noricum. A climate cold, and more ſparingly fruitful (Solinus).

NORIN, a river which riſes in a corner of the Venetian confines, that runs between the rugged marble hills, and is left entirely to itſelf from its very ſource; hence a vaſt tract of land is overflowed by it, and encumbered with reeds, willows, and wild elders. A ſmall ſpace of ground only remains dry between the roots of the hills and the marſh at a place called *Prud*, and that is all covered with pieces of ancient hewn ſtones, fragments of inſcriptions, columns, and capitals, and baſs reliefs of the beſt age, worn and deformed by time, and the barbariſm of the northern people, who begun on that ſide to deſtroy Narona. The inhabitants, who go often to cut reeds in the marſh, aſſert, that the veſtiges of that large city may ſtill be ſeen under water. It appears to have been extended over the plain a great way, and undoubtedly it was three miles in length at the foot of the hills. The ancient road is now under water; and it is neceſſary to aſcend a very ſteep road, in order to paſs the point of a craggy hill, on which probably before the Roman times thoſe fortifications were erected that coſt Vatinius ſo much labour.

NORIS (Henry), cardinal, who was a great ornament of the order of the monks of St Auguſtine, was deſcended from the preſident Jaſon, or James de Noris, and born at Verona 1631. He was carefully educated by his father Alexander Noris, originally of Ireland, and well known by his Hiſtory of Germany. He diſcovered from his infancy an excellent underſtanding, great vivacity, and a quick apprehenſion. His father inſtructed him in the rudiments of grammar, and procured an able profeſſor of Verona, called *Maſſoleini*, to be his preceptor. At 15 he was admitted a penſioner in the Jeſuits college at Rimini, where he ſtudied philoſophy; after which he applied himſelf to the writings of the fathers of the church, particularly thoſe of St Auguſtine: and taking the habit in the convent of the Auguſtine monks of Rimini, he diſtinguiſhed himſelf among that fraternity in a ſhort time by his erudition: inſomuch, that as ſoon as he was out of his noviciate or time of probation, the general of the order ſent for him to Rome, in order to give him an opportunity of improving himſelf in the more ſolid branches of learning. He did not diſappoint his ſuperior's expectations. He gave himſelf up entirely to his ſtudy, and ſpent whole days, and even nights, in the library of the Angeliques of St Auguſtine. His conſtant courſe [illegible] to ſtick to his books 14 hours a day; and this courſe he continued till he became a cardinal. By this means he became qualified to inſtruct others; and on this errand he was ſent firſt to Pezaro, and thence to Perouſa, where he took his degree of doctor of divinity; after which proceeding to Padua, he applied himſelf to finiſh his Hiſtory of Pelagianiſm. He had begun it at Rome at the age of 26; and having completed his deſign, the book was printed at Florence and publiſhed in 1673. The great duke of Tuſcany invited him the following year to that city, made him his chaplain, and profeſſor of eccleſiaſtical hiſtory in the univerſity of Piſa, which his highneſs had founded with that view.

In his hiſtory he ſet forth and defended the condemnation pronounced, in the eighth general council, againſt Origen and Mopſueſta, the firſt authors of the Pelagian errors: he alſo added an account of the Schiſm of Aquileia, and a Vindication of the Books written by St Auguſtine againſt the Pelagians and Semi-Pelagians. The work had procured him a great reputation, but met with ſeveral antagoniſts, to whom he publiſhed proper anſwers: the diſpute grew warm, and was carried before the ſovereign tribunal of the inquiſition. There the hiſtory was examined with the utmoſt rigour, and the author diſmiſſed without the leaſt cenſure. It was reprinted twice afterwards, and Mr Noris honoured by Pope Clement X. with the title of Qualificator of the Holy Office. Notwithſtanding this, the charge was renewed againſt the Pelagian Hiſtory, and it was dilated afreſh before the inquiſition in 1676; but it came out again with the ſame ſucceſs as at firſt. Mr Noris was now ſuffered to remain in peace for ſixteen years, and taught eccleſiaſtical hiſtory at Piſa, without any moleſtation, till he was called to Rome by Innocent XII. who made him under-librarian of the Vatican in 1692. This poſt was the way to a cardinal's hat; his accuſers therefore took freſh fire, and publiſhed ſeveral new pieces againſt him. Hence the Pope appointed ſome learned divines, who had the character of having taken neither ſide, to re-examine Father Noris's books, and make their report of them. Their teſtimony was ſo advantageous to the author, that his holineſs made him counſellor of the inquiſition. Yet neither did this hinder one of his adverſaries, the moſt formidable on account of his erudition, to riſe up againſt him, and attack him warmly, under the aſſumed title of a *Scrupulous Doctor of the Sorbonne*. Noris tried to remove theſe ſcruples in a work which appeared in 1695, under the title of An Hiſtorical Diſſertation concerning one of the Trinity that ſuffered in the Fleſh; wherein, having juſtified the monks of Scythia, who made uſe of that expreſſion, he vindicated himſelf alſo from the imputation of having attainted the Pope's infallibility, of hav g abuſed Vincentius Lirinenſis, and other biſhops Gaul, as favourers of Semi-Pelagianiſm, and of ha g himſelf gone into the errors of the biſhop of Ypre

H anſwers to all theſe accuſations were ſo much to t ſatisfaction of the pope, that at length his holine honoured him with the purple in 1695. After thi he was in all the congregations, and employed in th moſt important affairs; ſo that he had little time to pend in his ſtudy, a thing of which he frequently c mplained to his friends. Upon [illegible] death of Cardin Caſanati, he was made chief library keeper of the atican in 1770; and two years afterwards nominated, mong others, to reform the kalendar: but he died at Rome in 1704 of a dropſy. He was one of the moſt learned men in the laſt century: his writings abound with erudition, and are very elegantly finiſhed. He was a member of the Academy; whence he aſſumed the name of Eucrates Agoretico. His works are numerous, and were publiſhed at Verona, in 1729 and 1730, in five volumes folio.

NORKOPING, a town of Sweden, in the province of Eaſt Gothland, in eaſt longitude 15° 30′, latitude 58° 20′. Its name ſignifies "the northern market," in the Swediſh language. It ſtands on the banks of a large river called *Motala*, which coming from the lake *Vetter*, falls a little lower into a gulf called *Brawiken*. It is the largeſt and moſt populous town in Sweden, next to Stockholm, conveniently ſituated near the [illegible] a navigable river, which brings large veſſels up to the middle of the town. There are ſome handſome ſtreets, and the houſes in general are neatly built. Some of the churches are worth ſeeing; but the greateſt curioſity are the famous copper mines, where there is a vaſt number of people conſtantly at work. In this article the town carries on a very good trade; as alſo in ſeveral other manufactures, as leather, ſteel, and guns, which they make the beſt in Sweden.

[illegible] large ſpace of ground, being ten miles [illegible] but the houſes are ſmall and ſcattered, [illegible] the inhabitants do not exceed 10,000. The river Motala flows through the town, forms a ſeries of cataracts, and is divided into four principal ſtreams, which encircle ſeveral rocky iſlands, covered with houſes and manufactories. At the extremity of the town it is navigable for ſmall veſſels. Several manufactories are eſtabliſhed in the town; 55 fabrics of cloth, which employ 1500 men; 3 ſugar-houſes; 1 of ſnuff; 50 mills for grinding corn, which is exported in large quantities; and a braſs foundery. A ſalmon fiſhery gives employment and riches to many of the inhabitants.

NORMANDY, a province of France, bounded on the north by the Engliſh channel; on the eaſt by Picardy and the Iſle of France; o the ſouth by Perche and Maine, and one part of Bretagne; and on the weſt by the ocean. In is about 155 miles in length, 85 in breadth, and 600 in circumference. It is one of the moſt fertile, aud brings in the largeſt revenue of the kingdom. It abounds in all things except wine, but they ſupply that defect by cyder and perry. There are vaſt meadows, fat paſtures, and the ſea yields plenty of fiſh. It contains iron, copper, and a great number of rivers and harbours. It carries on a great trade, is very populous, and comprehends a vaſt number of towns and villages. It is divided into the Upper and Lower; the Upper borders upon Picardy, and the Lower upon Bretagne. It contains ſeven dioceſes or biſhoprics, Rouen, Bayeux, Avranches, Evreux, Sées, Liſieux, and Coutances, in which they compute [illegible] pariſhes, and 80 abbeys. The inhabitants [illegible] ions, and capable of underſtanding any arts and ſciences; but they are chiefly fond of law. The Normans, a people of Denmark and Norway, having entered France under Rollo, Charles the Simple ceded this country to them in 912, which from that time was called *Normandy*, and contains about 8200 ſquare miles. Its chief city is Rouen. Rollo was the firſt duke, and held it as a fief of the crown of France, and ſeveral of his ſucceſſors after him, till William, the ſeventh duke, conquered England in 1066: from which time it became a province of England, till it was loſt in the reign of King John, and reunited to the crown of France; but the Engliſh ſtill keep the iſlands on the coaſts of Normandy.

The principal rivers are the Seine, the Eure, the Aure, the Iton, the Dive, the Andelle, the Rille, the Touque, the Drômee, and the Orne: among the ſea ports, the principal are thoſe of Dieppe, Havre, Honfleur, Cherburg, and Granville. Rouen is the principal city.

NORMANS, a fierce warlike people of Norway, Denmark, and other parts of Scandinavia. They at different times overran and ravaged moſt countries in Europe: to the reſpective hiſtories of thoſe countries we therefore refer for a fuller account of them, as it is impoſſible to enlarge upon particulars in this place without repeating what has been already ſaid, or may be ſaid, in different parts of the work.

Norman Characters, a ſpecies of writing introduced into England by William I. From ſome old manuſcripts the Norman writing appears to have been compoſed of letters nearly Lombardic. In regal grants, charters, public inſtruments, and law proceedings, this character was uſed with very little variation from the reign of the Conqueror to that of Edward III. See Writing.

NORRIS, or Noris. See Noris.

NORRIS (John), a learned Engliſh divine and Platonic philoſopher, was born in 1657 at Collingborne-Kingſton, in Wiltſhire, of which place his father Mr John Norris was then miniſter. He bred his ſon firſt at Wincheſter ſchool, and afterwards ſent him to Exeter college in Oxford, where he was admitted in 1676; but was elected fellow of All Souls in 1680, ſoon after he had taken his degree of bachelor of arts. From his firſt application to philoſophy, Plato became his favourite author; by degrees he grew deeply enamoured with the beauties of that divine writer, as he thought him; and took an early occaſion to communicate his ideal happineſs to the public, by printing an Engliſh tranſlation of a rhapſody, under the title of The Picture of Love Unveiled, in 1682. He commenced maſter of arts in 1684, and the ſame year opened a correſpondence with that learned myſtic divine Dr Henry More of Chriſt's college in Cambridge. He had alſo a correſpondence with the learned Lady Maſham, Dr Cudworth's daughter, and the ingenious Mrs Aſtell. He reſided at his college, and had been

Norris, North.

in holy orders five years, when he was preſented to the rectory of Newton St Loe, in Somerſetſhire, 1689; upon which occaſion he married and reſigned his fellowſhip. In 1691, his diſtinguiſhed merit procured him the rectory of Bemerton, near Sarum. This living, upwards of 200l. a-year, came very ſeaſonably to his growing family; and was the more acceptable, for the eaſineſs of the parochial duty, which gave him leiſure to make an addition to his revenues by the fruits of his genius; the activity of which produced a large harveſt, that continued increaſing till 1710. But this activity ſeems to have become fatal to him; for towards the latter end of his life, he grew very infirm, and died in 1711, in his 54th year, at Bemerton. He was interred in the chancel of that church, where there is a handſome marble monument erected to his memory, with this inſcription: "H. S. E. Johannes Norris, parochiæ hujus rector, ubi annos viginti bene latuit curæ paſtorali et literis vacans, quo in receſſu ſibi poſuit latè per orbem ſparſa ingenii paris ac pietatis monumenta. Obiit an. Dom. 1711, ætatis 54." As to his character, he had a tincture of enthuſiaſm in his compoſition, which led him to imbibe the principles of the idealiſts in philoſophy, and the myſtics in theology; and the whole turn of his poetry ſhows, that this enthuſiaſm alone made him a poet. As an idealiſt, he oppoſed Locke, and adorned Malebranche's opinion, of ſeeing all things in God, with all the advantages of ſtyle and perſpicuity of expreſſion. In ſhort, his errors, which are harmleſs enough of themſelves, ought to be eaſily pardoned, on account of the general excellence of his writings, eſpecially upon ſubjects of practical divinity, which are univerſally eſteemed.

NORTH, one of the four cardinal points of the world; being that point of the horizon which is directly oppoſite to the ſun in meridian. The north wind is generally accompanied with a conſiderable degree of cold. It ſometimes blows with almoſt irreſiſtible fury. It is often mentioned by the claſſic authors under the name of *Boreas*, which is of Greek original. See Boreas.

North Pole. See Pole.

North (Dudley, lord), the third baron of that accompliſhed family, was one of the fineſt gentlemen in the court of King James; but in ſupporting that character, diſſipated and gamed away the greateſt part of his fortune. In 1645, he appears to have acted with the parliament; and was nominated by them to be adminiſtrator of the admiralty, in conjunction with the great earls of Northumberland, Eſſex, Warwick, and others. He lived to the age of 85, the latter part of which he paſſed in retirement; and wrote a ſmall folio of miſcellanies, in proſe and verſe, under this title, A Foreſt promiſcuous of ſeveral Seaſons Productions, in four parts, 1659.

North (Dudley, lord), ſon of the former, was made knight of the Bath in 1616, at the creation of Charles prince of Wales; and ſat in many parliaments, till excluded by the prevailing party in that which condemned the king. From that period Lord North lived privately in the country, and towards the end of his life entertained himſelf with books, and, as his numerous iſſue required, with economy; on which he wrote a little tract, called *Obſervations and advices economical*, 12mo. His other works are, Paſſages relating to the long parliament; the hiſtory of the life of Lord Edward North, the firſt baron of the family, addreſſed to his eldeſt ſon; and a volume of Eſſays.

North.

North (Francis lord Guildford, lord-keeper of the great ſeal in the reigns of Charles II. and James II.) was a third ſon of the ſecond Dudley lord North, baron of Kertling; and ſtudied at St John's college in Cambridge, from whence he removed to the Middle Temple. He acquired French, Italian, Spaniſh, and Dutch; and became not only a good lawyer, but was well verſed in hiſtory, mathematics, philoſophy, and muſic. He was afterwards made the king's ſolicitor-general, and was choſen to repreſent the borough of Lynn in parliament. He ſucceeded Sir Heneage Finch in the poſt of attorney-general; and Lord Chief Juſtice Vaughan, in the place of lord chief-juſtice of the common pleas. He was afterwards made keeper of the great ſeal: and in 1683 was created a baron, by the title of *Lord Guildford*. He died at his houſe at Wroxton in 1685. He wrote a philoſophical eſſay on muſic: a paper on the gravitation of fluids, conſidered in the bladders of fiſhes, printed in Lowthorp's abridgement of the Philoſophical Tranſactions; and ſome other pieces.

North (Right Hon. Frederick), earl of Guildford, Lord North, lord warden and admiral of the Cinque Ports, governor of Dover caſtle, lord lieutenant and cuſtos rotulorum of Somerſetſhire, chancellor of the univerſity of Oxford, recorder of Glouceſter and Taunton, an elder brother of the Trinity houſe, preſident of the Foundling hoſpital and of the Aſylum, a governor of the Turkey Company and of the Charter houſe, K. G. and LL. D. was born April 13. 1732; and married, May 20. 1756, Miſs Ann Speke, an heireſs of the ancient family of Dillington in Somerſetſhire, by whom he has left two ſons and three daughters: the eldeſt ſon George Auguſtus, born Sept. 11. 1757, and married, Sept. 30. 1785, to Miſs Hobart, ſucceeds to the earldom and eſtates. The late earl ſucceeded his father Auguſt 4. 1790. His lordſhip ſucceeded the celebrated Mr Charles Townſend as manager of the houſe of commons and chancellor of the exchequer; and in 1770, on the reſignation of the duke of Grafton, was made firſt lord of the treaſury; in which office he continued until the cloſe of the American war, or rather until the formation of the Rockingham miniſtry, which began the buſineſs of peace with the colonies. He was a man of ſtrong mental faculties; and as an orator, at once commanded attention and enforced conviction: but taking the helm at a time when the king's party were unpopular, and when it was ſuppoſed that the late earl of Bute was the great machine by which the cabinet was moved, ſo he continued in that ſtate of unpopularity until he reſigned the ſeals. During the whole of his premierſhip (and to conduct the helm at that time required uncommonly great abilities) he ſtudiouſly avoided impoſing any taxes that ſhould materially affect the lower claſs of people. The luxuries, and not the neceſſaries, of life were repeated objects of his budget. As a financier, he ſtood high, even in the opinion of oppoſition; and they were a combination of all the great talents in the kingdom, but, fatally wedded to the deſtructive plan of ſubduing the

North
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republican ſpirit of the Americans, his adminiſtration will not only ſtand marked in the page of hiſtory with an immenſe waſte of public treaſure, but it will appear beſprinkled with the kindred blood of thouſands of Britiſh ſubjects. To the very laſt moment he ſpoke in the ſenate, however, he defended that war; and ſaid, he was then, as he was formerly, prepared to meet the minuteſt inveſtigation as to his conduct in that buſineſs; which nothing but the unforeſeen intervention of France could have prevented from being crowned with ſucceſs. His lordſhip was one of the firmeſt and moſt ſtrenuous ſupporters of the conſtitution in church and ſtate. He died on the 5th of Auguſt 1792. His recollection he retained to his laſt moments: his family, except Lord North, who came within a few minutes afterwards, were aſſembled round his bed, and he took leave of them individually. Their grief did not ſuffer them to leave the room for ſome time after the event; and Lady Caroline Douglas was at laſt forced from it. Even Dr Warren, who muſt be ſtrengthened as far as habit can operate againſt nature to endure ſuch ſcenes, ran from this, convulſed with ſorrow. If any extent of ſympathy can leſſen affliction, this family may find ſuch relief; for perhaps no man was ever more generally beloved by all who had acceſs to him than the earl of Guildford.

We may form an opinion of the eſtimation the celebrated univerſity of Oxford entertained of their chancellor while living, by the very great honour they paid to his remains. About five o'clock in the afternoon of the 15th, the great bell at St Mary's church at Oxford rang out, which was a ſignal that the funeral proceſſion had arrived in the environs of that city. The officers of the univerſity, and the whole body of reſident ſtudents, were previouſly aſſembled in Magdalen College, in order to pay ſome tribute to the memory of their deceaſed chancellor. They joined the proceſſion at Magdalen Bridge, and paraded on foot before the herſe up the high ſtreet to Carfax; from thence down the corn market to St Giles's church at the town's end, in a moſt ſolemn manner. Here they halted, and opening to the right and left, the herſe and other carriages paſſed through, the whole univerſity being uncovered. The herſe and attendants then proceeded to Banbury, where his lordſhip's remains were depoſited in the family vault.

North Cape, the moſt northerly promontory in Europe, on the coaſt of Norway. E. Long. 21. 0. N. Lat. 78. 0.

North Ferry, a ſmall village, on the north ſide of the frith of Forth, at the Queen's Ferry paſſage. There was here formerly a chapel, ſerved by the monks of Dunfermline, and endowed by Robert I. Near it are large granite quarries, which partly ſupply London with paving ſtones, and employ many veſſels for the conveyance. "The granite (Mr Pennant ſays) lies in perpendicular ſtrata, and above is a reddiſh earth, filled with micaceous friable nodules."

North Foreland, a cape or promontory of Kent, in the iſle of Thanet, four miles eaſt of Margate. Between this and the South Foreland are the Downs, through which all ſhips paſs that are bound to or from the weſt. E. Long. 1. 25. N. Lat. 51. 25.

North-Weſt Paſſage, a paſſage to the Pacific ocean through Hudſon's bay or Davis's ſtraits, and which hath been frequently attempted without ſucceſs; notwithſtanding which, many people are ſtill of opinion that it is practicable.

The idea of a paſſage to the Eaſt Indies by the north pole, or through ſome opening near to it, was ſuggeſted as early as the year 1527. The perſon who had the honour to conceive this idea was Robert Thorne, a merchant of Briſtol, who addreſſed two papers on the ſubject, the one to King Henry VIII. the other to Dr Ley, ambaſſador from that monarch to the emperor Charles V. To remove any objection to the undertaking, which might be drawn from the ſuppoſed danger, he inſiſts, in his addreſs to the king, upon the great advantages of conſtant daylight in the polar ſeas, and the probability of the climate being in thoſe regions temperate during the ſummer months. In the paper addreſſed to Dr Ley, he obſerves that coſmographers may as probably be miſtaken in the opinion which they entertain of the polar regions being impaſſable from extreme cold, as it has been found they were in ſuppoſing the countries under the line to be uninhabitable from exceſſive heat.

The poſſibility of the paſſage was, in conſequence of theſe addreſſes, very generally ſuppoſed; and in 1557, Sir Martin Forbiſher ſailed to 62 north latitude, where he diſcovered the ſtraits which have ſince bore his name. In 1577, Barne, in a book entitled the *Regiment of the Sea*, mentions a north-weſt paſſage as one of the five ways to Cathay; and dwells on the mildneſs of the climate, which, from the conſtant preſence of the ſun during ſummer, he imagines muſt be found near the pole. In 1578, George Beſt, a gentleman who had been with Sir Martin Forbiſher in his voyages of diſcovery, wrote a very ingenious diſcourſe to prove all parts of the world habitable. It does not, however, appear that any voyage was undertaken, for the expreſs purpoſe of attempting to ſail to India in a north-weſt direction, till the year 1607, when Henry Hudſon was ſent, at the expence of ſome merchants in London, to diſcover a paſſage by the north pole to Japan and China. He ſailed from Graveſend on the 1ſt of May, and on the 21ſt of June fell in with the land to the weſtward, in latitude 73, which he named *Hold-with-hope*. On the 27th he diſcovered Spitſbergen, and met with much ice. The higheſt latitude in which he made an obſervation was 80° 27'. See Hudson.

In March 1609, Jones Poole was ſent by Sir Thomas Smith, and the reſt of the Muſcovy Company, to make further diſcoveries towards the north pole. After great ſeverity of weather, and much difficulty from ice, he made the ſouth part of Spitſbergen on the 16th of May; and ſailing along and ſounding the coaſt, he made many accurate diſcoveries; but was not in that voyage able to proceed beyond 79° 50'. He was again employed (1611), in a ſmall veſſel called the *Elizabeth*, to attempt the north-weſt paſſage; but after ſurmounting numberleſs difficulties, and penetrating to 80° of latitude, he loſt his ſhip at Spitſbergen. Two voyages, equally unſucceſsful, were made in 1614 and 1615, by Baffin and Fotherby; the latter of whom concludes the account of his diſcoveries and dangers, with exhorting the company which employed him not to adventure more than 150l. or 200l. at moſt on yearly voyages to theſe ſeas.

Hitherto nothing had been done in this great undertaking but by private adventurers, fitted out for the

North-weſt Paſſage.

the double purpoſe of diſcovery and preſent advantage; and the polar regions were ſuffered to remain unexplored in that direction, from the year 1615 till 1773 when the earl of Sandwich, in conſequence of an application which had been made to him by the Royal Society, laid before his majeſty a propoſal for an expedition to try how far navigation is practicable towards the north pole. Upon receiving this propoſal, his majeſty was pleaſed to direct that the voyage ſhould be immediately undertaken, with every aſſiſtance that could contribute to its ſucceſs. Accordingly, the Racehorſe and Carcaſs bombs were fitted out for the purpoſe, and the command of the expedition given to Captain Phipps, now Lord Mulgrave. His Lordſhip's inſtructions were to proceed up to the pole, or as far towards it as poſſible, and as nearly upon a meridian as the ice or other obſtructions ſhould admit; and during the courſe of the voyage, to make ſuch obſervations of every kind as might be uſeful to navigation, or tend to the promotion of natural knowledge. A very accurate account of this voyage was publiſhed by his Lordſhip in 1774. He had, by exerting all the powers of a ſkilful and intrepid ſeaman, forced his way, on the 1ſt of Auguſt, to 80° 37′; but could proceed no farther, as he was there oppoſed by one continued plain of ſmooth unbroken ice, bounded only by the horizon.

Many other attempts have been made to diſcover this paſſage, by ſailing along the weſtern coaſt of America; but hitherto none of them has been crowned with ſucceſs. So early as 1579, Sir Francis Drake aſſured Queen Elizabeth that he had ſailed ſome leagues up the ſtraits of Anian (ſee Anian), and diſcovered New Albion, to the north of California; but the ſtrait is now known to have no exiſtence; and Drake's real diſcoveries were not improved. In 1638, King Charles I. ſent Captain Luke Fox in one of his pinnaces to attempt the paſſage; but of his proceedings we know nothing, but that he reached Port Nelſon in Hudſon's bay, where he found ſome remains of former navigators. Next year Captain James was fitted out by the merchants of Briſtol for the ſame purpoſe. James was one of the ableſt navigators that ever ſailed from England or any other country; and his voyages to the north were printed in 1633. After all the experiments he had made, he concluded that there was no ſuch paſſage; or if there be, he affirmed that the diſcovery of it would not be attended with thoſe advantages which are commonly expected. His reaſons, however, for theſe opinions have been anſwered, and many ſubſequent attempts have been made to perform what he thought impoſſible. The arguments for a north-weſt paſſage were ſo plauſible, that, in 1744, an act of parliament was paſſed to encourage the diſcovery of it. Among many others, Captain Cook attempted the diſcovery in vain, and thence adopted James's opinion. (See *Cook's Diſcoveries*, N° 103.) This celebrated navigator, after having proceeded northwards to the weſtern extremity of America, and aſcertained the proximity of the two great continents of Aſia and America, returned to the Sandwich iſlands, firmly perſuaded of the impracticability of a paſſage in that hemiſphere from the Atlantic into the Pacific ocean, either by an eaſtern or a weſtern courſe.

Later voyagers, however, have pretended to detect ſome errors in Cook's diſcoveries and the author of a ſmall tract, entitled *An authentic Statement of all the Facts relative to Nootka Sound*, goes a great way to make the diſcovery not yet hopeleſs. In his account of the expedition under the direction of Meſſrs Etches, he ſays, that "one of the firſt diſcoveries made by theſe ſhips was, that what was by the immortal Cook laid down as a continuation of the north-weſt continent of America, and lying between the northern latitudes of 48 and 57, is on the contrary an extenſive cluſter of unexplored iſlands inhabited by numerous tribes of friendly Indians, with whom a regular connexion was formed."

North-eaſt Paſſage.

Theſe iſlands they diſcovered, contrary to the aſſertion of Captain Cook, to conceal the opening of a vaſt inland ſea, or archipelago, in all probability equal to the Mediterranean or Baltic ſeas, and dividing the great northern continent of America. The Princeſs Royal penetrated ſome hundred leagues among them, in a north-eaſt courſe, to within 200 leagues of Hudſon's houſe, but had not then an opportunity to explore the extreme termination of that archipelago, their commercial concerns obliging them to return to the China market; but the commanders had the ſtrongeſt reaſons to believe, had the time favoured their ſurvey, that they ſhould have been able to diſcover the long wiſhed for paſſage between the Atlantic and South ſea. They conceived, that ſhould neither the inland arm of the ſea through which the Princeſs Royal penetrated, nor a large ſtrait named Sir Charles Middleton's about three degrees to the ſouthward, be found to reach acroſs the continent, yet that the land barrier muſt be very inconſiderable; and that at the extremity of this bay a practicable paſſage, either by rivers or lakes, will, by perſeverance, be found terminating towards Hudſon's bay.

Upon the whole, however, it appears to us extremely doubtful whether there be ſuch a paſſage; but it is much more likely to be diſcovered, if diſcovered at all, by the progreſſive advances of mercantile enterpriſe than by any immediate expedition undertaken for that purpoſe.

North-Eaſt Paſſage, a paſſage to the Eaſt Indies along the northern coaſts of Aſia, which, like the former, hath frequently been attempted, but hitherto without ſucceſs. The firſt attempt was made in 1553, by Sir Hugh Willoughby, who commanded three ſhips. He departed from the Thames and ſailed to the North Cape, where one of his ſhips left him, and returned home. The other two ſhips being ſeparated, Sir Hugh proceeded farther northward, and diſcovered that part of Greenland which the Dutch have ſince called *Spitzberg*; but the ſeverity of the cold obliging him to return to the ſouthward, he was forced, by bad weather, into the river Arzina, in Muſcovite Lapland, where, not being able to come out, he was found the next ſpring frozen to death, with all his ſhip's company; having the notes of his voyage and his laſt will lying before him, whereby it appeared that he lived till January. But Richard Chancellor, in the third ſhip, with better ſucceſs, in the meanwhile entered Wardhuys, where he waited ſome time for his companions to no purpoſe; uncertain whether they were loſt, or driven farther by ſtreſs of weather. He held a council on what he ſhould do; whether to

return,

North-eaſt Paſſage.

return, or purſue his voyage. Whatever danger might be in the laſt, every one agreed to it, that they might not ſeem to have leſs courage than their captain. They therefore ſet ſail, and in a few days found themſelves in a ſea where they could no longer perceive any night. This ſhip, wandering about, entered ſoon after into a large bay or gulf. Here they caſt anchor, in ſight of land; and while they were examining the coaſt, they diſcovered a fiſhing boat. Chancellor getting into his ſloop, went towards it; but the fiſhermen took to flight. He followed, and, overtaking them, ſhowed them ſuch civilities as conciliated their affections to him; and they carried him to the place where now is the famous port of St Michael the Archangel. Theſe people immediately ſpread through all the coaſts an account of the arrival of thoſe ſtrangers; and people came from ſeveral parts to ſee them, and aſk them queſtions. They, in their turn, examined the others, and found that the country they were in was Ruſſia, governed by the mighty emperor John Baſilowitz. Chancellor from Archangel travelled on ſledges to the Czar at Moſcow; from whom, overjoyed at the proſpect of opening a maritime commerce with Europe, he obtained privileges for the Engliſh merchants, and letters to King Edward VI. who was not, however, alive to receive them.

In 1585, Mr John Davis in two barks diſcovered Cape Deſolation, which is ſuppoſed to be part of Greenland; and two years after advanced as far as Lat. 72°, where he diſcovered the ſtrait which ſtill bears his name. To enumerate all the attempts which have been made to diſcover a north-eaſt paſſage, would ſwell the article to very little purpoſe. The Engliſh, Dutch, and Danes, have all attempted it without ſucceſs. The laſt voyage from England for this purpoſe was made in 1676, under the patronage of the duke of York. That unfortunate prince, who was on all occaſions earneſt for the promotion of commerce, and the Lord Berkeley, &c. fitted out a ſhip, commanded by Captain Wood, for an attempt once more to find a north-eaſt paſſage to India, accompanied with a ſhip of the king's. They were encouraged to this attempt, after it had been ſo long deſpaired of, by ſeveral new reports and reaſonings: ſome of which ſeem not to have been very well grounded—As,

"1. On the coaſt of Corea, near Japan, whales had been found with Engliſh and Dutch harpoons ſticking in them. This is no infallible proof that ſhips could get thither by a north-eaſt paſſage, although whales might.

"2. That, 20 years before, ſome Dutchmen had ſailed within one degree of the north pole, and found it temperate weather there: and that therefore William Barents, the Dutch navigator who wintered at Nova Zembla in the year 1596, ſhould have ſailed further to the north before turning eaſtward; in which caſe, ſaid they, he would not have found ſo much obſtruction from the ice.

"3. That two Dutch ſhips had lately ſailed 300 leagues to the eaſtward of Nova Zembla; but their Eaſt India Company had ſtifled that deſign, as againſt their intereſt:—and ſuch like other airy reports. But this attempt proved very unfortunate. They doubled the North Cape, and came among much ice and drift wood, in 76° of north latitude, ſteering to the coaſt of Nova Zembla, where the king's ſhip ſtruck upon the rocks, and was ſoon beat to pieces; and Captain Wood returned home with an opinion, "that ſuch a paſſage was utterly impracticable, and that Nova Zembla is a part of the continent of Greenland."

Theſe paſſages, however, are not yet deemed impracticable by all. The Count de Buffon holds it for certain, that there is a paſſage from Europe to China by the north ſea. The reaſon why it has been ſo often attempted in vain, he thinks, is, that fear prevented the undertakers from keeping at a ſufficient diſtance from land, and from approaching the pole, which they probably imagined to be an immenſe rock. Hence he affirms, that if any farther attempts be made to find a paſſage to China and Japan by the north ſeas, it will be neceſſary to keep at a diſtance from the land and the ice; to ſteer directly towards the pole; and to explore the moſt open ſeas, where unqueſtionably, ſays he, there is little or no ice. This opinion has been lately revived by the Hon. Daines Barrington, who ſays, that if the paſſage be attempted by the pole itſelf, he has very little doubt of its being accompliſhed. See *North-Pole*.

Northampton.

NORTHAMPTON, a town in England, capital of a county of the ſame name, ſituated in W. Long. 0. 55. N. Lat. 52. 15. According to Camden, it was formerly called *North-afandon*, from its ſituation to the north of the river Nen, called anciently *Afona*, by which and another leſſer river it is almoſt encloſed. Dr Gibſon ſays, that the ancient Saxon annals called both it and Southampton ſimply *Hamton*; and afterwards, to diſtinguiſh them, called the one, from its ſituation, *Southamton*, and the other *Northamton*; but never *North-afandon*. Though it does not appear to be a place of very great antiquity, nor to have emerged from obſcurity till after the Conqueſt, it has ſent members to parliament ſince the reign of Edward I. and being in the heart of the kingdom, ſeveral parliaments have been held at it. There was alſo a caſtle, and a church dedicated to St Andrew, built by Simon de Sancto Licio, commonly called *Senlez*, the firſt earl of Northampton of that name. It is ſaid to have been burnt down during the Daniſh depredations; but in the reign of St Edward it appears to have been a conſiderable place. It was beſieged by the barons in their war with King John; at which time that military work called *Hunſhill*, is ſuppoſed to have been raiſed. In the time of Henry III. it ſided with the barons, when it was beſieged and taken by the king. Here the bloody battle was fought in which Henry VI. was taken priſoner. It was entirely conſumed by a moſt dreadful fire in 1675; yet, by the help of liberal contributions from all parts of the country, it hath ſo recovered itſelf, that it is now one of the neateſt and beſt built towns of the kingdom. Among the public buildings which are all lofty, the moſt remarkable are the church called *All-hallows* (which ſtands at the meeting of four ſpacious ſtreets), the ſeſſions and aſſize houſe, and the George inn, which belongs to the poor of the town. A county hoſpital or infirmary has been lately built here, after the manner of thoſe of Bath, London, Briſtol, &c. It has a conſiderable manufacture of ſhoes and ſtockings; and its fairs are noted for horſes both for draught and ſaddle; beſides, it is a great thoroughfare for the north and weſt roads. It was formerly walled, and had ſeven churches within and two without. The horſe market is reckoned to exceed all others in the kingdom, it being deemed the centre of all its horſe markets and horſe fairs, both for ſaddle and harneſs, and the chief rendezvous of the jockies both from York and London. Its principal manufacture is ſho[illegible] which great numbers are ſent beyond ſea; and the next to that, ſtockings and lace, as we have hinted at above. It is the richer and more populous, by being a thoroughfare both in the north and weſt roads; but, being 80 miles from the ſea, it can have no commerce by navigation. The walls of this town were above two miles in compaſs. It is ſuppoſed to contain about 1083 houſes, and 5200 inhabitants. It had formerly a nunnery in the neighbouring meadows, with ſeveral other monaſteries; and of its very old caſtle on the weſt ſide of the town, a ſmall part of the ruins are ſtill to be ſeen. Some diſcontented ſcholars came hither from Oxford and Cambridge, about the end of the reign of Henry III. and, with the king's leave, proſecuted their ſtudies here academically for three years; during which there was the face of an univerſity, till it was put a ſtop to by expreſs prohibition, becauſe it was a damage to both univerſities. The public horſe races are on a neighbouring down, called *Pye-Leys*. In and about the town are abundance of cherry gardens. Within half a mile of the town is one of the croſſes erected by King Edward I. in memory of his queen Eleanor, whoſe corpſe was reſted there in its way to Weſtminſter. On the north ſide of the river, near that croſs, many Roman coins have been ploughed up. At Guileſborough, north-weſt of Northampton, are to be ſeen the veſtiges of a Roman camp, the ſituation of which is the more remarkable, as lying between the Nen and the Avon, the only paſs from the north to the ſouth parts of England not intercepted by any river. This camp was ſecured only by a ſingle intrenchment, which was, however, very broad and deep.

Northamptonshirf, a county of England, is ſituated in the very heart of the kingdom: bounded on the eaſt by the counties of Bedford and Huntingdon; on the ſouth by thoſe of Buckingham and Oxford; on the weſt by Warwickſhire; and on the north by the counties of Leiceſter, Rutland, and Lincoln, which are ſeparated from it by the Leſſer Avon, and the Welland. Its greateſt length is about 50 miles, its greateſt breadth about 20, and its circumference about 130. It contains 330 pariſhes. There are in it one city, 11 market towns, 25,000 houſes, and 150,000 inhabitants. Nine members are returned to parliament for this county, viz. two knights for the ſhire, two for the city of Peterborough, two for each of the towns of Northampton and Brockly, and one for Higham Ferrers. It lies in the mid-land circuit, and in the dioceſe of Peterborough. As this county is dry, well cultivated, free from marſhes, except the fens about Peterborough, in the centre of the kingdom, and of courſe at a diſtance from the ſea, it enjoys a very pure and wholeſome air. In conſequence of this it is very populous, and ſo full of towns and churches, that 30 ſpires or ſteeples may be ſeen in many places at one view; and even in the fens, the inhabitants ſeem to enjoy a good ſtate of health, and to be little affected by the water which frequently overflows their grounds, eſpecially in winter, but is never ſuffered to remain long upon it. Its ſoil is exceeding fertile both in corn and paſturage; but it labours under a ſcarcity of fuel, as it doth not produce much wood, and, by lying at a diſtance from the ſea, cannot be eaſily ſupplied with coal. Its commodities, beſides corn, are ſheep, wool, black cattle, and ſaltpetre; and its manufactures are ſerges, tammies, ſhalloons, boots, and ſhoes. Beſides many leſſer brooks and ſtreams, it is well watered by the rivers Nen, Welland, Ouſe, and Leam; the three firſt of which are large, and for the moſt part navigable.

NORTHAMPTON, a county of North America, in Virginia, forming the ſouth part of the peninſula on the eaſtern coaſt of Virginia.

NORTH rocks, (otherwiſe called *St Patrick's rocks*, from a ſeat of ſtone amongſt them called *St Patrick's chair*, whence the rocks have taken this ſecond name; ſituated in the harbour of Donaghadee, in the county of Down, and province of Ulſter, in Ireland. From north to ſouth they are about two thirds of a league, between which is clean good ground. But care muſt be taken of the ſouth rock, on which many ſhips have periſhed: for it is overflowed by every tide, and no crew can ſave their lives if the wind blows high. This rock ſtands a full mile from the ſhore.

NORTH Sea. See *North Sea*.

NORTHERN lights, the ſame with Aurora Borealis, under which article we have given a copious account of this phenomenon, and of the ſuppoſed cauſes of it. Natural ſcience, however, does not arrive at perfection at once, and it is well if it does ſo after trials repeated for years with care and accuracy. How far the cauſes that have been aſſigned for this appearance will account for it, or whether they will be able to remove all difficulties, it is not for us to determine; but it is the part of philoſophers to hear all ſides, and to attend with patient aſſiduity to every hypotheſis, rejecting or receiving as reaſon, after the ſtricteſt inveſtigation, ſhall ſeem to favour the one ſide or the other. Wiſhing to lay before our readers every thing important either in ſcience or in literature, we cannot let paſs the opportunity which the preſent article affords us, of mentioning a hypotheſis which Doctor Stearns, an American, formed, about the year 1788, to account for the appearances called *aurora borealis*, and *aurora auſtralis*. For this laſt, ſee Aurora Borealis, N° 3.

Doctor Stearns ſuppoſes that theſe phenomena originate from aqueous, nitrous, ſulphureous, bituminous, and other exhalations, from the fumes of various kinds of earths or other minerals, vegetables, animals, fires, volcanoes, &c. Theſe, he thinks, become rarefied, and being charged with electrical fluid, become ſpecifically lighter than the circumambient air; hence, of courſe, they aſcend; and being elevated to the upper regions of the air, and driven by the winds from warmer to colder climates, the cold makes them combine and ſtiffen. When they are afterwards agitated by different currents of air, they ſparkle and crackle like the hairs of cats and other animals when ſtiffened with cold. This coruſcation in quite cold atmoſpheres, and in thoſe which are more temperate, appears in different poſitions in the horizon, zenith, or otherwiſe, according to the ſituation of the ſpectator, and the poſition of the elevated exhalations. The difference of colours the Doctor ſuppoſes to ariſe from the different qualities of the articles combined, thoſe of the moſt inflammable nature ſhining with the greateſt luſtre.

The Doctor likewiſe tries to account for theſe lights not appearing, or but ſeldom appearing, in ancient times. The atmoſphere, he thinks, was not impregnated with materials proper to produce them. He imagines that the increaſed conſumption of fuel, in America in particular, the burning of volcanoes, and the approach of blazing ſtars, whoſe atmoſpheres have been ſo expanded by the ſun's heat that part of them have fallen into the earth's atmoſphere, and communicated to it new matter, have ſo changed and prepared our air, that whenever its conſiſtence is proper, then, if the light of the ſun and moon is not too powerful, the aurora borealis will appear.

NORTHUMBERLAND, the moſt northerly county of England, and formerly a diſtinct kingdom, is bounded on the north and weſt by the river Tweed, which divides it from Scotland, the Cheviot hills, and part of Cumberland; waſhed on the eaſt by the German ocean; and ſeparated from Durham on the ſouth by the rivers Tyne and Derwent. This county, which gives the title of *duke* to a nobleman who married the daughter of Algernon duke of Somerſet, whoſe mother was heireſs of the Piercy family, extends about 66 miles in length from north to ſouth, and about 47 in breadth from eaſt to weſt. It is remarkably populous, containing 12 market towns, 280 villages, and 460 pariſhes. The face of the country, eſpecially towards the weſt, is roughened with huge mountains, the moſt remarkable of which are the Cheviot hills, and the high ridge called *Rideſdale;* but the lands are level towards the ſea ſide and the borders of Durham. The climate, like that of every other mountainous country in the neighbourhood of the ſea, is moiſt and diſagreeable: the air, however, is pure and healthy, as being well ventilated by breezes and ſtrong gales of wind; and in winter mitigated by the warm vapours from the two ſeas, the Iriſh and the German ocean, between which it is ſituated. The ſoil varies in different parts of the county. Among the hills it is barren; though it affords good paſture for ſheep, which cover thoſe mountains. The low country, when properly cultivated, produces plenty of wheat, and all ſorts of grain; and great part of it is laid out in meadow lands and rich encloſures. Northumberland is well watered with many rivers, rivulets, and fountains: its greateſt rivers are the Tweed and the Tyne. The Tyne is compoſed of two ſtreams called *South* and *North Tyne:* the firſt riſes on the verge of Cumberland, near Alſton Moor; enters Northumberland, running north to Haltweſel; then bends eaſterly, and receiving the two ſmall rivers Eaſt and Weſt Alon, unites above Hexham with the other branch, taking its riſe at a mountain called *Fane-head* in the weſtern part of the county, thence called *Tine-dale;* is ſwelled in its courſe by the little river Shele; joins the Read near Billingham; and running in a direct line to the ſouth-eaſt, is united with the ſouthern Tyne, forming a large river that waſhes Newcaſtle, and falls into the German ocean near Tinmouth.

In all probability the mountains of Northumberland contain lead ore and other mineralized metals in their bowels, as they in all reſpects reſemble thoſe parts of Wales and Scotland where lead mines have been found and p[illegible]ed. Perhaps the inhabitants are diverted from [illegible] of this nature, by the certain profits and co[illegible]employment they enjoy in working the coal pits, with which this county abounds. The city of London and the greateſt part of England, are ſupplied with fuel from theſe ſtores of Northumberland, which are inexhauſtible, enrich the proprietors, and employ an incredible number of hands and ſhipping. About 658,858 chaldrons are annually ſhipped for London.

There are no natural woods of any conſequence in this county; but many plantations belonging to the ſeats of noblemen and gentlemen, of which here is a great number. As for pot herbs, roots, ſalading, and every article of the kitchen garden and orchard, they are here raiſed in great plenty by the uſual means of cultivation; as are alſo the fruits of more delicate flavour, ſuch as the apricot, peach, and nectarine. The ſpontaneous fruits it produces in common with other parts of Great Britain, are the crab-apple, the ſloe or bullace, the hazel nut, the acorn, hips, and haws, with the berries of the bramble, the juniper, wood ſtrawberries, cranberries, and bilberries.

Northumberland raiſes a good number of excellent horſes and black cattle, and affords paſture for numerous flocks of ſheep; both the cattle and ſheep are of a large breed, but the wool is coarſer than that which the more ſouthern counties produce. The hills and mountains abound with a variety of game, ſuch as red deer, foxes, hares, rabbits, heathcock, grouſe, partridge, quail, plover, teal, and woodcock: indeed, this is counted one of the beſt ſporting counties in Great Britain. The ſea and rivers are well ſtocked with fiſh; eſpecially the Tweed, in which a vaſt number of ſalmon is caught and carried to Tinmouth, where being pickled, they are conveyed by ſea to London, and ſold under the name of *Newcaſtle Salmon.*

The Northumbrians were anciently ſtigmatized as a ſavage, barbarous people, addicted to cruelty, and inured to rapine. The truth is, before the union of the two crowns of England and Scotland, the borderers on each ſide were extremely licentious and ungovernable, trained up to war from their infancy, and habituated to plunder by the mutual incurſions made into each kingdom; incurſions which neither truce nor treaty could totally prevent. People of a pacific diſpoſition, who propoſed to earn their livelihood by agriculture, would not on any terms remain in a country expoſed to the firſt violence of a bold and deſperate enemy; therefore the lands lay uncultivated, and in a great meaſure deſerted by every body but lawleſs adventurers, who ſubſiſted by theft and rapine. There was a tract 50 miles in length and 6 in breadth, between Berwick and Carliſle, known by the name of the *Debateable Land,* to which both nations laid claim, though it belonged to neither; and this was occupied by a ſet of banditti who plundered on each ſide, and what they ſtole in one kingdom, they ſold openly in the other:

nay, they were ſo dexterous in their occupation, that by means of hot bread applied to the horns of the cattle which they ſtole, they twiſted them in ſuch a manner, that, when the right owners ſaw them in the market, they did not know their own property. Wardens were appointed to guard the marches or borders in each kingdom; and theſe [illegible] always conferred on noblemen of the [illegible] for influence, valour, and integrity. The Engliſh border was divided into three marches, called the *eaſt*, *weſt*, and *middle marches*; the gentlemen of the country were conſtituted deputy wardens, who held march-courts, regulated the watches, diſciplined the militia, and took meaſures for aſſembling them in arms at the firſt alarm: but in the time of peace between the two nations, they were chiefly employed in ſuppreſſing the inſolence and rapine of the borderers. Since the union of the crowns, however, Northumberland is totally changed, both with reſpect to the improvement of the lands, and the reformation of the inhabitants. The grounds, being now ſecure from incurſion and inſult, are ſettled by creditable farmers, and cultivated like other parts of the kingdom. As hoſtilities have long ceaſed, the people have forgot the uſe of arms, and exerciſed themſelves in the more eligible avocations of peace; in breeding ſheep and cattle, manuring the grounds, working at the coal pits, and in different branches of commerce and manufacture. In their perſons they are generally tall, ſtrong, bold, hardy, and fleſh coloured; and though leſs unpoliſhed than their anceſtors, not quite ſo civilized as their ſouthern neighbours. The commonalty are well fed, lodged, and clothed; and all of them remarkably diſtinguiſhed by a kind of *ſhibboleth* or *wharle*, being a particular way of pronouncing the letter *R*, as if they hawked it up from the windpipe, like the cawing of rooks. In other reſpects, the language they ſpeak is an uncouth mixture of the Engliſh and Scottiſh dialects. There is no material diſtinction between the faſhionable people of Northumberland and thoſe of the ſame rank in other parts of the kingdom; the ſame form of education will produce the ſame effects in all countries. The gentlemen of Northumberland, however, are remarkable for their courage, hoſpitality, and hard drinking. The number of inhabitants is reckoned 126,400, of houſes 22,740.

A great number of Roman monuments have been found in this county; but the moſt remarkable curioſity of that kind conſiſts in the remains of Hadrian's vallum and the wall of Severus. See *Adrian*, note (a), and *Severus's Wall*.

The moſt noted towns in Northumberland, are Newcaſtle, Morpeth, Alnwick, Berwick, Hexham, and North Shields. It ſends two members to parliament.

NORTHWICK, a ſmall town of Cheſhire, long celebrated for its rock ſalt and brine pits. The ſtratum of ſalt lies about 40 yards deep; and ſome of the pits are hollowed into the form of a temple. The deſcent is through a dome, the roof ſupported by rows of pillars about two yards thick, and ſeveral in height; and when illuminated with a ſufficient number of candles, they make a moſt magnificent appearance. Above the ſalt is a bed of whitiſh clay (*Argilla cerulo-cinerea*), uſed in making the Liverpool earthen ware; and in the ſame place is alſo dug a good deal of the gypſum, or plaſter ſtone. The foſſil ſalt is generally yellow, and ſemipellucid, ſometimes debaſed with a dull greeniſh earth; and is often found, but in ſmall quantities, quite clear and colourleſs. The town is ſituated near the river Dane, and is tolerably handſome: it has a market on Fridays. It is 20 miles north-eaſt of Cheſter, and 173 north-weſt of London. W. Long. 2. 36. N. Lat. 53. 16.

NORTON, in Cheſhire, a good modern alms houſe, founded by P—y Brooke, Eſq; on the ſite of a priory of canons regular of St Auguſtine, founded by William, ſon of Nigellus, A. D. 1135, who did not live to complete his deſign; for Euſtace de Burgaville granted to Hugh de Catherine paſtures for 100 ſheep, in caſe he finiſhed the church in all reſpects conformable to the intent of the founders. It was granted afterwards to R. Brooke, Eſq.

NORTON'S sound, was diſcovered in Capt. Cook's laſt voyage, and was ſo named in honour of Sir Fletcher Norton (Lord Grantley), a near relation of Mr, afterwards Dr, King. It extends as far as N. Lat. 64° 55'. There is no good ſtation for ſhips, nor even a tolerable harbour in all the ſound. Mr King, on his landing here, diſcerned many ſpacious valleys, with rivers flowing through them, well wooded, and bounded with hills of a moderate height. One of the rivers towards the north-weſt ſeemed to be conſiderable; and he was inclined to ſuppoſe, from its direction, that it diſcharged itſelf into the ſea from the head of the bay. Some of his people, penetrating beyond this into the country, found the trees to be of a larger ſize the further they proceeded. E. Long. 197. 13. N. Lat. 64. 31.

NORWAY, a country of Europe (for the map ſee Denmark), lying between the 57th and 72d degrees of north latitude, and between the 5th and 31ſt degrees of longitude eaſt from London; extending in length about 1000 miles, in a direct line from Lindeſnaes, in the dioceſe of Chriſtianſand, to the North Cape, at the extremity of Finmark. Its breadth, from the frontiers of Sweden weſtward to Cape Statt, may amount to about 300 miles; but from thence the country becomes gradually narrower towards the north. On the ſouth it is bounded by the Schagen rock, or Categatt, the entrance into the Baltic; on the eaſt it is divided from Sweden by a long ridge of high mountains; and on the weſt and north it is waſhed by the northern ocean. In the ſouthern part of Norway, the country is craggy, abrupt, and mountainous, diverſified ſometimes with fertile and even delightful ſpots. In theſe reſpects it reſembles Switzerland: the proſpects and the meteorological phenomena ſeem to be very ſimilar. The range of the thermometer is of great extent; in the ſummer having riſen to 88°, and in the winter fallen to —40°: in general it is between 80° and —22°.

Reſpecting the population of Norway it is difficult to attain to certainty. An author of ſome note (Coxe) ſeems to think it amounts to 750,000; but he appears to have over-rated it conſiderably.

The Norwegian peaſants are free, well clothed, well lodged, [illegible] [illegible] frank, open, and undaunted. They are ſaid to [illegible] very conſiderable reſemblance to the peaſants of Switzerland. The ſoil is too thin for the plough: corn is therefore obtained from the neighbouring ſtates; and the chief employment of the peaſants of Norway is grazing. The following extract from Mr Coxe, being a deſcription of the ſcene near Chriſtiana, is not beſide our purpoſe, and may not perhaps be diſagreeable to our readers.

Coxe's Travels.

"As we approached Chriſtiana, the country was more wild and hilly, but ſtill very fertile and agreeable; and about two miles from the town we came to the top of a mountain, and burſt upon as fine a view as ever I beheld. From the point in which we ſtood in raptures, the grounds laid out in rich encloſures, gradually ſloped to the ſea; below us appeared Chriſtiana, ſituated at the extremity of an extenſive and fertile valley, forming a ſemicircular bend along the ſhore of a moſt beautiful bay, which, being encloſed by hills, uplands, and foreſts, had the appearance of a large lake. Behind, before, and around, the inland mountains of Norway roſe on mountains covered with dark foreſts of pines and fir, the inexhauſtible riches of the north. The moſt diſtant ſummits were caped with eternal ſnow. From the glow of the atmoſphere, the warmth of the weather, the variety of the productions, and the mild beauties of the adjacent ſcenery, I could ſcarcely believe that I was nearly in the 60th degree of northern latitude."

The coaſt of Norway, extending above 300 leagues, is ſtudded with a multitude of ſmall iſlands, affording habitation to fiſhermen and pilots, and paſture to a few cattle. They form an infinite number of narrow channels, and a natural barrier of rocks, which renders Norway inacceſſible to the naval power of its enemies. Attempts of this kind are the more dangerous, as the ſhore is generally bold, ſteep, and impending; ſo that cloſe to the rocks the depth of the ſea amounts to 100, 200, or 300 fathoms. The perils of the north ſea are moreover increaſed by ſudden ſtorms, ſunk rocks, violent currents, and dreadful whirlpools. The moſt remarkable vortex on this coaſt is called *Moſkoe-ſtrom*, from the ſmall iſland Moſkoe, belonging to the diſtrict of Lofoden in the province of Nordland. In time of flood, the ſtream runs up between Lofoden and Moſkoe with the moſt boiſterous rapidity; but in its ebb to the ſea, it roars like a thouſand cataracts, ſo as to be heard at the diſtance of many leagues. The ſurface exhibits different vortices; and if in one of theſe any ſhip or veſſel is abſorbed, it is whirled down to the bottom, and daſhed in pieces againſt the rocks. Theſe violent whirlpools continue without intervals, except for a quarter of an hour, at high and low water, in calm weather; for the boiling gradually returns as the flood or ebb advances. When its fury is heightened by a ſtorm, no veſſel ought to venture within a league of it. Whales have been frequently abſorbed within the vortex, and howled and bellowed hideouſly in their fruitleſs endeavours to diſengage themſelves. A bear, in attempting to ſwim from Lofoden to Moſkoe, was once hurried into this whirlpool, from whence he ſtruggled in vain for deliverance, roaring ſo loud as to be heard on ſhore; but notwithſtanding all his efforts, he was borne down and deſtroyed. Large trees being abſorbed by the current, are ſucked down, and riſe again all ſhattered into ſplinters. There are three vortices of the ſame kind near the iſlands of Ferroe.

Norway is divided into the four governments of Aggerhus, Bergen, Drontheim, and Wardhus, beſides that of Bahus, which is now ſubject to Sweden. The province of Aggerhus comprehends the ſouth-eaſt part of Norway, extending in length about 300 miles. Its chief towns are Chriſtiana, the ſee of a biſhop, ſuffragan to the metropolitan ſee of Drontheim, where the ſupreme court of juſtice is held, in preſence of the viceroy and the governor of the province; Aggerhus, about 15 miles to the ſouth-weſt of Chriſtiana; Frederickſhall or Frederickſtadt, in the ſiege of which Charles XII. of Sweden loſt his life: Saltzberg, Tonſberg, Alleen, Hammar, and Hollen.

The government of Bergen lies in the moſt ſoutherly and weſterly part of Norway, including the city of the ſame name, which is an epiſcopal ſee, and a place of conſiderable trade; and Staff-hanger, ſituated in the bay of Buckenfior, about 80 miles to the ſouthward of Bergen. The third province, called *Drontheim* or *Trontheim*, extends about 500 miles along the coaſt; and is but thinly peopled. The chief town Drontheim, ſeated on a little gulf at the mouth of the river Nider, is the only metropolitan ſee in Norway; and carries on a conſiderable trade in maſts, deals, tar, copper, and iron. Leetſtrand, Stronden, Scoerdale, Opdal, Romſdael, and Solendael, are likewiſe places of ſome traffic. The northern diviſion of Drontheim, called the *ſub-government of Salten*, comprehends the towns Melanger and Scheen. The province of Wardhus, extending to the North Cape, and including the iſlands, is divided into two parts; namely, Finmark and Norwegian Lapland. The chief town, which is very inconſiderable, ſtands upon an iſland called *Ward*, from whence the place and the government derive their name. The province of Bahus, though now yielded to the Swedes, is reckoned part of Norway, being a narrow tract of land, about 90 miles in length, lying on the coaſt of the Categate.

The great chain of Norway mountains, running from north to ſouth, called indifferently *Rudfield*, *Sudfield*, *Skarsfield*, and *Scoreberg*, is known in different parts by other appellations; ſuch as *Dofrefiell*, *Lamsfield*, *Sagnifield*, *Filefield*, *Halnefield*, *Hardangerfield*, *Joklefield*, *Byglefield*, *Hicklefield*, and *Hangfield*. The height and breadth of this extenſive chain likewiſe vary in different parts. To paſs the mountain Hardanger, a man muſt travel about 70 Engliſh miles, whereas Filefield may be about 50 over. This laſt riſes about two miles and a half in perpendicular height; but Dofrefield is counted the higheſt mountain of Norway, if not of Europe. The river Drivane winds along the ſide of it in a ſerpentine courſe, ſo as to be met nine times by thoſe who travel the winter road to the other ſide of the chain. The bridges are thrown over roaring cataracts, and but indifferently faſtened to the ſteep rocks on either ſide; ſo that the whole exhibits a very dreadful appearance, ſufficient to deter the traveller from hazarding ſuch a dangerous paſſage; for which reaſon, people generally chooſe the road over Filefield, which is much more tedious. This, however, is the poſt road uſed by the king's carriages. The way is diſtinguiſhed by poſts fixed at the diſtance of 200 paces from each other, that, in ſnowy or dark weather, the traveller may not be bewildered. For the convenience of reſting and refreſhing, there are two mountain ſtoves or houſes maintained on Filefield, as well as upon other mountains, at the expence of the public, and furniſhed with fire, light, and kitchen utenſils. Nothing can be more diſmal and dreary than thoſe mountains covered with [illegible] ſnow, where neither houſe, tree, nor living creature is to be ſeen, but here and there a ſolitary rein deer, and perchance a few wandering Laplanders.

In travelling from Sweden to Nordenfields, there is only one way of avoiding this chain of mountains; and that is, where it is interrupted by a long deep valley, extending from Romſdale to Guldbrandſdale. In the year 1612, a body of 1000 Scots, commanded by Sinclair, and ſent over as auxiliaries to the Swedes, were put to the ſword in this defile, by the peaſants of Guldbrand, who never give quarter.

Beſides this chain, there is a great number of detached mountains over all the country, that form valleys and ridges, inhabited by the peaſants. Some of theſe are of incredible height, and others exhibit very remarkable appearances. In ſailing up Joering Creek on the left hand, the ſight is aſtoniſhed with a group of mountains, reſembling the proſpect of a city, with old Gothic towers and edifices. In the pariſh of Oerſkoug is the high mountain Skopſhorn, the top of which repreſents the figure of a fortification, with regular walls and baſtions. In the diſtrict of Hilgeland appears a very high range of mountains, with ſeven pinnacles or creſts, known by the appellation of the *Seven Siſters*, diſcernible a great way off at ſea. To the ſouthward of this range, though in the ſame diſtrict, riſes the famous mountain *Torghatten*, ſo called becauſe the ſummit reſembles a man's head with a hat on, under which appears a ſingle eye, formed by an aperture through the mountain, 150 ells high, and 3000 ells in length. The ſun may be ſeen through this ſurpriſing cavity, which is paſſable by the foot of travellers. On the top of the mountain we find a reſervoir of water, as large as a moderate fiſh pond: in the lower part is a cavern, through which a line 400 fathoms in length, being let down, did not reach the bottom. At Herroe in Sundmoer is another cavern called *Dolſteen*, ſuppoſed to reach under the ſea to Scotland; which, however, is no more than an idle tradition. In the year 1750, two clergymen entered this ſubterranean cavity, and proceeded a conſiderable way, until they heard the ſea daſhing over their heads: the paſſage was as wide and high as an ordinary church, the ſides perpendicular, and the roof vaulted. They deſcended one flight of natural ſtairs; but arriving at another, they were afraid to penetrate farther: they had gone ſo far, however, that two candles were conſumed in their progreſs and return. A cavern of a very curious nature, ſerving as a conduit to a ſtream of water, penetrates through the ſides of the mountain Limur. In the diſtrict of Rake, in the neighbourhood of Frederickſhall, are three cavities in a rock; one of which is ſo deep, that a ſmall ſtone dropped down, does not reach the bottom in leſs than two minutes; and then the ſound it produces is pleaſant and melodious, not unlike the ſound of a bell.

The vaſt mountains and rugged rocks that deform the face of this country are productive of numberleſs inconveniences. They admit of little arable ground: they render the country in ſome parts impaſſable, and everywhere difficult to travellers: they afford ſhelter to wild beaſts, which come from their lurking holes, and make terrible havock among the flocks of cattle: they expoſe the ſheep and goats, as well as the peaſant, to daily accidents of falling over precipices: they occaſion ſudden torrents, and falls of ſnow, which deſcend with incredible impetuoſity, and often ſweep away the labours of the huſbandman; and they are ſubject to dreadful diſruptions, by which huge rocks are rent from their ſides, and, hurling down, overwhelm the plains below with inevitable ruin. The peaſants frequently build their houſes on the edge of a ſteep precipice, to which they muſt climb by ladders, at the hazard of their lives; and when a perſon dies, the corpſe muſt be let down with ropes, before it can be laid in the coffin. In winter the mail is often drawn up the ſides of ſteep mountains. Even in the king's road, travellers are expoſed to the frequent riſks of falling over thoſe dreadful rocks; for they are obliged to paſs over narrow pathways, without rails or riſing on the ſides, either ſhored up with rotten poſts, or ſuſpended by iron bolts faſtened in the mountains. In the narrow paſs of Naeroe is a remarkable way of this kind, which, above 600 years ago, the famous King Surre cauſed to be made for the paſſage of his cavalry; and even this would have been found impaſſable by any other horſes than thoſe of Norway, which are uſed to climb the rocks like goats. Another very difficult and dangerous road is that between Shogſtadt and Vang-in-Volders, along the ſide of a ſteep mountain, in ſome places ſo narrow, that if two travellers on horſeback ſhould meet in the night, they would find it impracticable either to paſs each other, or turn back. In ſuch a caſe their lives could not be ſaved, unleſs one of them ſhould alight, and throw his horſe headlong into the lake below, and then cling to the rock, until the other could paſs. When a ſheep or goat makes a falſe ſtep to the projection of a rock, from whence it can neither aſcend nor deſcend, the owner hazards his own life to preſerve that of the animal. He directs himſelf to be lowered down from the top of the mountain, ſitting on a croſs ſtick, tied to the end of a long rope; and when he arrives at the place where the creature ſtands, he faſtens it to the ſame cord, and it is drawn up with himſelf. Perhaps the other end of the rope is held by one perſon only; and there are ſome inſtances in which the aſſiſtant has been dragged down by the weight of his friend, ſo that both have periſhed. When either man or beaſt has had the misfortune to fall over very high precipices, they have not only been ſuffocated by the repercuſſion of the air, but their bodies have been always burſt before they reached the ground. Sometimes entire creſts of rocks, many fathoms in length and breadth, have fallen down at once, creating ſuch a violent agitation of the air, as ſeemed a prelude to the world's diſſolution. At Steenbroe in Laerdale, a ſtupendous maſs, larger than any caſtle in the univerſe, appears to have been ſevered and tumbled from the mountain in large, ſharp, and ragged fragments, through which the river roars with hideous bellowing. In the year 1731, a promontory on Sundmoer, called *Rammerſfield*, that hung over Nordal Creek, ſuddenly gave way, and plunged into the water; which ſwelled to ſuch a degree, that the church of Strand, though half a league on the other ſide of the bank, was overflowed: the creek, however, was not filled up; on the contrary the fiſhermen declare they find no difference in the depth, which is ſaid to exceed 900 fathoms.

The remarkable rivers of Norway are theſe: The Nied, iſſuing from Tydalen, on the borders of Sweden, runs weſtward into the lake Selboe; and afterwards, turning to the northward, paſſes by the city of Drontheim, to which it anciently gave the name of *Nidaros* and *Nidroſia*: Sule Ely, that deſcending from Sulefield, runs with a rapid courſe through Nordale into the ſea: Gulen, which riſes near Sſarsfield in the north; and running 20 leagues weſtward, through Aalen, Hlotaalen, Storen, and Melhuus, diſcharges itſelf into the ſea, about a league to the weſt of Drontheim. In the year 1344, this river buried itſelf under ground: from whence it again burſt forth with ſuch violence, that the earth and ſtones thrown up by the eruption filled the valley, and formed a dam; which, however, was ſoon broken and waſhed away by the force of the water. Divers churches, 48 farm houſes, with 250 perſons, were deſtroyed on this occaſion.—Otteroen, a large river, taking its riſe from the mountain Agde, runs about 30 leagues through Seeterdale and Eſie, and diſembogues itſelf into the cataract of Wiland. The river Syre riſes near the mountain Lang, and winds its courſe through the vale of Syre into the lake of Lunde in the dioceſe of Chriſtianſand; thence it continues its way to the ſea, into which it diſcharges itſelf through a narrow ſtrait formed by two rocks. This contraction augments its impetuoſity, ſo that it ſhoots like an arrow into the ſea, in which it produces a very great agitation. Nid and Sheen are two conſiderable rivers, iſſuing out of Tillemark. Their water-falls have been diverted, with infinite labour, by canals and paſſages cut through the rocks, for the convenience of floating down the timber. Tyrefiord or Dramme, is in the neighbourhood of Honifoſſe, joined by two rivers from Oedale and Hadeland, and diſembogues itſelf into the ſea near Bragneſs. Loven riſes in the higheſt part of Nummedal, and runs through Konſberg to the ſea near Laurwig. Glaamen is the largeſt river of Norway, diſtinguiſhed by the name of *Stor Elvin*, or the *great river*. It derives its origin from the mountain Dofre, from whence it winds all along the plains of Oeſterdale and Soloe; then joins the Vorme, another conſiderable river riſing out of Mioes and Guldbrandſdale. Theſe being joined, traverſe the lake Oeyeren; and thence iſſuing, run on to Sarp near Frederickſtadt.

Norway abounds with freſh water lakes; the principal of which are Ryſvand in Nordland, Snaaſen, Selboe, the Greater and Leſſer Mioes, Slirevand, Sperdille, Rand, Veſtn, Saren, Modum, Lund, Norſoe, Huidſoe, Fariſvand, and Oeyevand: all theſe are well ſtocked with fiſh, and navigable for large veſſels. Wars have been formerly carried on upon theſe inland ſeas; in ſome of which are ſmall floating iſlands, or parcels of earth, with trees on them, ſeparated from the main land, and probably preſerved in compact maſſes by the roots of trees, ſhrubs, and graſs, interwoven in the ſoil. In the year 1702, the family ſeat of Borge, near Frederickſtadt, being a noble edifice, with lofty towers and battlements, ſuddenly ſunk into an abyſs 100 fathoms deep, which was inſtantaneouſly filled by a piece of water 300 ells in length, and about half as broad. Fourteen perſons, with 200 head of cattle, periſhed in this cataſtrophe, which was occaſioned by the river Glaamen precipitating itſelf down a water-fall near Sarp, and undermining the foundation. Of all the water-falls in Norway this of Sarp is the moſt dangerous for its height and rapidity. The current drives 17 mills; and roars with ſuch violence, that the water, being daſhed and comminuted among the rocks, riſes in the form of mist, where a beautiful rainbow may be always ſeen when the ſun ſhines. In ancient times this cataract was made uſe of for the execution of traitors and other malefactors: they were thrown down alive, that they might be daſhed in pieces on the points of rocks, and die in a dreadful commotion, analogous to thoſe they had endeavoured to excite in the community.

Great part of Norway is covered with foreſts of wood, which conſtitute the principal article of commerce in this country. They chiefly conſiſt of fir and pine, for which great ſums are received from foreigners, who export an immenſe number of maſts, beams, planks, and boards. Beſides, an incredible quantity is conſumed at home in building houſes, ſhips, bridges, piles, moles, and fences; over and above the vaſt demand for charcoal to the founderies, and fuel for domeſtic uſes.—Nay, in ſome places, the trees are felled for no other purpoſe but to clear the ground and to be burned into aſhes for manure. A good quantity of timber is yearly exported to Scotland and Spain: but this is inconſiderable when compared to the vaſt exports from Drammen, Frederickſhall or Frederickſtadt, Chriſtiana, Skeen, Arendal, Chriſtianſand, Chriſtian's Bay, and Drontheim. The maſts and large beams are floated down the rivers, and the reſt is divided into boards at the ſaw mills. Theſe works ſupply a vaſt number of families with a comfortable ſubſiſtence.—A tenth part of all ſawed timber belongs to his Daniſh majeſty, and makes a conſiderable branch of his revenue. The foreſts in Norway are ſo vaſt and thick, that the people ſeem to think there can never be a ſcarcity of wood, eſpecially as the ſoil is peculiarly adapted for the production of timber: they therefore deſtroy it with a waſteful hand; inſomuch that more wood rots in Norway than is burned in the whole kingdom of Denmark. The beſt timber grows in the provinces of Saltan, Helleland, Romſdale, Guldbrandſdale, Oeſterdale, Soloe, Valders, Hallingdale, Sogniſiord, Tellemark, and the lordſhip of Nedene.

The climate of Norway is very different in different parts of the kingdom. At Bergen the winter is ſo moderate, that the ſeas are always open and practicable both to mariners and fiſhermen, except in creeks and bays, that reach far up into the country towards Filefield, when the keen north-eaſt wind blows from the land. On the eaſt ſide of Norway from the frontiers of Sweden to Fileſield, the cold generally ſets in about the middle of October with great ſeverity, and laſts till the middle of April; during which interval the waters are frozen to a very conſiderable thickneſs, and the face of the country is covered with ſnow. In the year 1719, 7500 Swedes, who intended to attack Drontheim, periſhed in the ſnow on the mountain of Ruden or Tydel, which ſeparates Jempteland in Sweden from the dioceſe of Drontheim. A company of 200 Norwegian ſledge-men under Major Emahus, found them all frozen to death on the ridge of the mountain, where they had been ſurpriſed by a ſtorm accompanied with ſnow, hail, and extreme cold. Some of theſe unhappy victims appeared ſitting, ſome lying, and others kneeling in a poſture of praying. They had cut in pieces their muſkets, and burned the little wood they afforded.—The Generals Labarre and Zoega loſt their lives; and of the whole corps, conſiſting originally of 10,000, no more than 2500 ſurvived this dreadful cataſtrophe.

The cold is ſtill more intenſe in that part of Norway called *Finmark*, ſituated in the frigid zone near the polar circle. But if the winter is generally cold, the ſummer is often exceſſively hot in Norway. The rays of the ſun are reverberated from the ſides of the mountains ſo as to render the weather cloſe and ſultry in the valleys; beſides, the ſun's abſence below the horizon is ſo ſhort, that the atmoſphere and mountains have not time to cool. The heat is ſo great, that vegetation is remarkably quick. Barley is ſown, grows, ripens, and is reaped, in the ſpace of ſix weeks or two months. The longeſt day at Bergen conſiſts of 19 hours; the ſun riſing at half an hour after two, and ſetting at half an hour after nine. * The ſhorteſt day does not exceed ſix hours; for the ſun riſes at nine in the morning, and ſets at three in the afternoon.—In the beginning of the year the daylight increaſes with remarkable celerity; and, at the approach of winter, decreaſes in the ſame proportion. In ſummer one may read and write at midnight by the light of the ſky. Chriſtian V. while he reſided at Drontheim, uſed to ſup at midnight without candles. In the diſtrict of Tromſen, at the extremity of Norway, the ſun is continually in view at midſummer. It is ſeen to circulate day and night round the north pole, contracting its orbit, and then gradually enlarging it, until at length it leaves the horizon. In the depth of winter, therefore, it is for ſome weeks inviſible; and all the light perceived at noon is a faint glimmering for about an hour and a half, proceeding from the reflexion of the ſun's rays from the higheſt mountains. But the inhabitants of theſe provinces are ſupplied with other lights that enable them to follow their employments in the open air. The ſky being generally ſerene, the moonſhine is remarkably bright, and, being reflected from the mountains, illuminates the valleys. They are alſo aſſiſted by the Aurora Borealis, which is very frequent in the northern parts of Europe.

The air of Norway is generally pure and ſalubrious. On the ſea coaſts, indeed, it is rendered moiſt by vapours and exhalations: but in the midland parts of the country, towards the mountains, the climate is ſo dry, that meal may be kept for many years without being worm eaten or damaged in the leaſt. The inhabitants have no idea of ſickneſs, except what is occaſioned by exceſſes. It is ſaid, that in the vale of Guldbrand the inhabitants live to ſuch extreme old age, that they become weary of life, and cauſe themſelves to be removed to a leſs ſalubrious climate, whereby they may have a chance of dying the ſooner. In conſumptions, however, the moiſt air on the ſea ſide is found to be moſt agreeable to the lungs in reſpiration. Norway, being a mountainous country interſected by creeks, abounding with lakes, rivers, and ſnow, muſt be ſubject to frequent rains; and from ſudden thaws the inhabitants are ſometimes expoſed to terrible diſaſters. Vaſt maſſes of ſnow falling from precipices overwhelm men, cattle, boats, houſes, nay even whole villages.—About two centuries ago, a whole pariſh was covered and deſtroyed by an immenſe maſs of ſnow; and ſeveral domeſtic utenſils, as ſciſſars, knives, and baſons, have been at different times brought to light by a rivulet that runs under the ſnow, which has been gradually hardened and increaſed by repeated froſts and annual acceſſions.

The winds that chiefly prevail on the weſtern coaſt are thoſe that blow from the ſouth; whereas, on the other ſide of Filefield, the winds that produce and continue the hard froſts are always northerly. In the ſummer, there is a kind of regular trade-wind on the coaſt of Bergen. In the forenoon the ſea begins to be cooled with a weſterly breeze, which continues till midnight. Then the land breeze begins from the eaſt, and blows till about ten in the morning. The coaſt is likewiſe ſubject to ſudden ſqualls and ſtorms. Hurricanes ſometimes riſe at ſea; and in theſe latitudes the phenomenon called a *water-ſpout* is not uncommon. One of theſe in the neighbourhood of Ferro is ſaid to have ſucked up with the water ſome laſts of herrings, which were afterwards dropped on Kolter, a mountain 1200 feet high.

The freſh water of Norway is not very light or pure; but on the contrary is generally turbid, and depoſites a ſediment of adventitious matter, being ſometimes impregnated with ochre and particles of iron.—Nevertheleſs it is agreeable to the taſte, and remarkably ſalubrious; as appears from the good health of the common people, who drink little or no other liquor.

The ſoil of Norway varies in different places according to the ſituation of rock or valley. The mountains here, as in every other country, are bare and barren; but the earth waſhed down from them by the rains enriches and fertilizes the valleys. In theſe the ſoil generally conſiſts of black mould, ſand, loam, chalk, and gravel, lying over one another in unequal ſtrata, and ſometimes in three or four ſucceſſions: the mould that lies uppermoſt is very fine and mellow, and fit to nouriſh all ſorts of vegetables. There is alſo clay found in different parts of this kingdom, of which the inhabitants begin to make earthen ware; but bricks and tiles are not uſed in building. The face of the country is in many places deformed by large ſwamps and marſhes, very dangerous to the traveller. Near Leeſſoe in the dioceſe of Chriſtianſand, a wooden cauſeway is extended near a mile over a moraſs; and if a horſe or any other animal ſhould make a falſe ſtep, he will ſink at once into the abyſs, never to riſe again.

In a cold country like Norway, roughened with rocks and mountains, interſperſed with bogs, and covered with foreſts, we cannot expect to find agriculture in perfection. The ploughed lands, in reſpect to mountains, woods, meadows, and waſtes, do not exceed the proportion of 1 to 80; ſo that the whole country does not produce corn to maintain above half the number of its inhabitants. The peaſants are diſcouraged from the practice of huſbandry by the frequency of accidents that ſeem peculiar to the climate. Even in the fruitful provinces of Guldbrandſdale, Oeſterdale, and Soloer, as well as in other places, when the corn appears in the moſt flouriſhing condition the whole hope of the harveſt is ſometimes deſtroyed in one night by a ſudden froſt that nips the blade and extinguiſhes the vegetation. The kingdom is moreover viſited by ſome unfavourable years, in which the ſun ſeems to have loſt his genial power; the vegetables are ſtunted; the trees bud and bloom, yet bear no fruit; and the grain, though it riſes, will yet produce nothing but empty ears and ſtraw. This calamity, however, rarely occurs; and in general the cultivated parts of Norway yield plentiful crops of excellent rye, barley, and oats. The moſt fruitful provinces are Nordland, Inderbarre, and Numedale, in the dioceſe of Drontheim; Sognifiord and Vaas, in that of Bergen; Jedderen, Ryefylſk, Raabygdelag, and the lordſhip of Nedenes, in the dioceſe of Chriſtianſand; Hedemark in the dioceſe of Aggerhus; Hadeland, Toten, Romerige, Ringerige, and Guldbrandſdale: theſe territories not only produce grain enough for their own conſumption, but likewiſe ſupport their neighbours, and even ſupply part of Sweden.—Peaſe are likewiſe propagated in this country, together with wheat, buck-wheat, hops, hemp, and flax, but not to any conſiderable advantage. The meadows are well ſtored with paſturage for ſheep and cattle, and the fields are productive of thoſe vegetables which are common in other northern countries. Within theſe 50 years the people of Norway have beſtowed ſome attention on the culture of gardens, which in former times was ſo neglected, that the cities and towns were ſupplied with leeks, cabbage, and roots, from England and Holland. At preſent, however, the Norwegians raiſe their own culinary and garden roots and vegetables, which thrive there as well as in any other country. The ſcurvy being a diſeaſe that prevails along the ſea coaſt, Nature has ſcattered upon it a variety of herbs efficacious in the cure of that diſtemper; ſuch as angelica, roſe-wort, gentian, creſſes, trefoil, ſorrel, ſcurvy-graſs, and a plant called *erich's graſs*, that grows in great plenty on the iſlands of Northland: from whence the people of the continent fetch away boat loads of it, to be preſerved in barrels as a ſuccedaneum for cabbage. There are alſo a few noxious vegetables little known in any country but Norway. In Guldbrandſdale is a ſpecies of graſs called *ſelſnape*; the root of which is ſo poiſonous, that any beaſt which eats of it dies immediately, the belly burſting; nay, the carnivorous fowls that prey upon the carcaſs of the beaſt meet with the ſame fate: children have been more than once poiſoned by this root, which nevertheleſs is ſometimes uſed externally as an amulet for arthritic diſorders. Another vegetable pernicious to the cattle is the *Gramen oſſifragum Norwegienſe*, which is ſaid to mollify the bones of the cattle which feed upon it. Among the noxious plants of Norway we may alſo reckon the igle-graſs, fatal to ſheep and goats; the tour-graſs, which affects horſes and cows with a ſort of lethargy; and the plant torboe, or hiſte-ſpring, which produces nearly the ſame effect on horſes, but is not at all prejudical to cows, ſheep, or any ruminating animals. The herb turte, not unlike angelica, operates nearly in the ſame manner; yet the bears are ſaid to feed upon it with peculiar reliſh; and when their hair begins to fall off by feeding upon this plant, they cure themſelves by eating the fleſh of animals.

The common fruit trees thrive tolerably well in Norway, the inhabitants of which have plenty of cherries, apples, and pears. Some kinds of plums attain maturity; which is ſeldom the caſe with grapes, apricots, and peaches. But even the apples and pears that ripen here are ſummer fruit; that which grows till the winter ſeldom comes to perfection. Great variety of agreeable berries are produced in different parts of this kingdom; ſuch as the hagebar, a kind of ſloes; an infuſion of which in wine makes a pleaſant cooling liquor; juniper berries, corinths red and white, ſoelbar or ſun berries, raſpberries, gooſeberries, blackberries, ſtrawberries, &c. with many other ſpecies that ſeem to be natives of Norway and Sweden. Among thoſe are the tranæbar, the produce of the myrtillus repens, red and auſtere, found in the ſpring in perfection under the ſnow, and much reliſhed by the reindeer; crakebeer, reſembling bilberries, deemed a powerful antiſcorbutic; agerbeer, larger and blacker than bilberries, of a pleaſant acid, ripened by cold, and uſed as cherries for an infuſion in wine; and finally tyltebeer, a red pleaſant berry growing on a ſhort ſtem, with leaves like thoſe of box, they are plucked off by handfuls, and ſent to Denmark to be preſerved for the table, where they are eaten by way of deſſert.

Of the trees that grow wild in Norway, the principal are the fir and the pine. The firſt yield an annual revenue of 1,000,000 of rixdollars, if we include the advantages reſulting from the ſaw mills and the maſts; one of which laſt has been known to ſell for 200 rixdollars. The red fir tree, which grows on the mountains, is ſo rich in turpentine as to be almoſt incorruptible. Some of the houſes belonging to the Norway peaſants, built of this timber, are ſuppoſed to be above 400 years ſtanding. In Guldbrandſdale the houſe is ſtill to be ſeen ſtanding in which King Olaf lodged five nights, above 700 years ago, when he travelled round the kingdom to convert the people to the Chriſtian faith. Even 100 years after the trunk of the fir tree has been cut down, the peaſants burn the roots for tar, which is a very profitable commodity. In the fens, the reſin of the fir tree is by nature transformed into a ſubſtance which may be called *Norway frankincenſe*. The buds or pine apples of this tree, boiled in ſtale beer, make an excellent medicine for the ſcurvy; leſs unpleaſant to the taſte, though as efficacious, as tar-water. The pine tree is more tall and beautiful than the fir, though inferior to it in ſtrength and quality: for which reaſon the planks of it are ſold at an inferior price, and the peaſants waſte it without remorſe. Norway likewiſe produces ſome foreſts of oak, which is found to be excellent for ſhip-building. Here alſo grow plenty of elm trees; the bark of which, being powdered, is boiled up with other food to fatten hogs, and even mixed by the poor among their meal: alſo the aſh, from which the peaſants diſtil a balſam uſed in certain diſorders, and which is uſed both externally and internally. Many other trees flouriſh in this country, an enumeration of which would prove too tedious. Hazels grow here in ſuch abundance, that 100 tons of the nuts are annually exported from Bergen alone.

A great diverſity of ſtones is found in Norway, ſome of which are of a ſurpriſing figure. Several mountains conſiſt chiefly of a brown pebble, which decays with age; nay, it ſometimes diſſolves, and drops into the ſea, and the cement being thus looſened, a terrible diſruption enſues. In ſome places the gray and black pebbles are intermixed with iron, copper, lead, ſilver, and gold. The ground [illegible] certain diſtricts is covered with the fragments of [illegible] that have been precipitated from the ſummits of mountains, and broken by their fall into innumerable ſhivers. Between 20 and 30 years ago, in the neighbourhood of Bergen, a man was ſuddenly overwhelmed with ſuch a maſs, which formed a kind of vault around him. In this dreadful tomb he remained alive for ſeveral weeks. By his loud cries the place of his confinement was diſcovered: but it was found impoſſible to remove the huge ſtones by which he was encloſed. All that his friends could do for him was, to lower down meat and drink through ſome crevices; but at length the ſtones fell in, and cruſhed him to death.

In Norway are inexhauſtible quarries of excellent marble, black, white, blue, gray, and variegated; together with ſome detached pieces of alabaſter, ſeveral kinds of ſpar, chalk-ſtone, cement-ſtone, ſand-ſtone, mill-ſtone, baking-ſtone, ſlate, talc, magnets; and ſwine-ſtone, a production natural to Norway and Sweden, of a brown colour, fetid ſmell, in texture reſembling cryſtal, and deriving its name from a ſuppoſed efficacy in curing a diſtemper incident to ſwine. Here alſo is found the amianthus or ſtone-flax, of which incombuſtible cloth may be made. Norway, however, affords no flints, but plenty of pyrites or quartz, beautiful cryſtals, granites, amethyſts, agate, thunder-ſtones, and eagle-ſtones. Gold has formerly been found in a ſmall quantity in the dioceſe of Chriſtianſand, and coined into ducats. There is at preſent a very conſiderable ſilver mine wrought at Kongſberg on the account and at the riſk of his Daniſh majeſty: the ore is ſurpriſingly rich, but interrupted in ſuch a manner, that the vein is often loſt. Many maſſes of pure ſilver have been found; and, among the reſt, one piece weighing 560 pounds, preſerved in the royal muſeum at Copenhagen. Such is the richneſs of theſe mines, that the annual produce amounts in value to a ton and a half in gold. About 5000 people are daily employed, and earn their ſubſiſtence, in thoſe ſtupendous works (A). Other ſilver mines are proſecuted at Jarlſberg, but not to the ſame advantage; and here the ore is mixed with lead and copper. In many parts of this country copper mines have been diſcovered; but the principal, and perhaps the richeſt in all Europe, is at Roraas, about 100 Engliſh miles from Drontheim. This work yields annually about 1100 ſhip pounds of pure copper: the founderies belonging to it conſume yearly about 14,000 laſts of coal, and 500 fathoms of wood. The next in importance is the copper work at Lykken, about 20 miles from Drontheim. A third mine is carried on at Indſet or Quickne, at the diſtance of 30 miles from the ſame place; and here they precipitate the copper from its menſtruum, by means of iron. There is a fourth copper work at Silboe, about 30 miles diſtant from Drontheim, though the leaſt conſiderable of the four. Other copper mines of leſs note are worked in different parts of the kingdom. Iron is ſtill in greater plenty, and was the firſt metal wrought in this country. Many hundred thouſand quintals are annually exported, chiefly in bars, and part of it in ſtoves, pots, kettles, and cannon: the national profit ariſing from this metal is eſtimated at 300,000 rixdollars. There is a ſpecies called *moor-iron*, found in large lumps among the moraſſes: of this the peaſants make their own domeſtic tools and utenſils, ſuch as knives, ſcythes, and axes. The lead found mixed in the ſilver ore is an article of ſmall importance in Norway; yet ſome mines of this metal have been lately opened in the diſtrict of Soloer by the proprietors of the copper work at Oudal. A vitriol work has been begun near Kongſberg: the mines yield great plenty of ſulphur; which, however, the Norwegians will not take the trouble to melt and depurate, becauſe immenſe quantities are found at a cheaper rate in the iſland of Iceland. Alum is found between the ſlate flakes near Chriſtiana in ſuch plenty, that works have been ſet up for refining this mineral, though they have not yet brought it to any degree of tranſparency. His Daniſh majeſty has eſtabliſhed ſalt works in the peninſula of Valoe, about ſix Engliſh miles from Tonſberg, where this mineral is extracted in large quantities from the ſea water.

Beſides the animals common to other countries, Norway is ſaid to contain many of the uncommon and dubious kind; ſuch as the kraken, mermaid, ſea ſerpent, &c. See theſe articles.

Many Daniſh, Engliſh, Scotch, Dutch, and German families have now ſettled in Norway; and indeed form no inconſiderble part of the trading people: but the original inhabitants are the deſcendants of thoſe ferocious Normanni, who haraſſed almoſt all the coaſts of Europe with piratical armaments in the 8th, 9th, and 10th centuries.

"Our firſt certain knowledge of the inhabitants of this country (ſays Pennant †) was from the deſolation they brought on the ſouthern nations by their piratical invaſions. Their country had before that period the name of *Nortmannaland*, and the inhabitants

† *Arct. Zool.*

(A) Mr Coxe tells us, that he viſited thoſe mines. They formerly, he ſays, produced annually 70,000l. but at preſent yield little more than 50,000l. The expences generally exceed the profits; and government gains only by the number of miners employed. The mines of cobalt, and the preparation of Pruſſian blue, are much more productive. The latter goes through 270 hands, and the number of men employed are 356. It is ſuppoſed, that, at this period (1793), it may produce to government a profit of 16,000l. a-year.

tants *Normans*; a title which included other adjacent people. Great Britain and Ireland were ravaged by them in 845; and they continued their invaſion till they effected the conqueſt of England, under their leader Canute the Great. They went up the Seine as far as Paris, burnt the town, and forced its weak monarch to purchaſe their abſence at the price of fourteen thouſand marks. They plundered Spain, and at length carried their excurſions through the Mediterranean to Italy, and even into Sicily. They uſed narrow veſſels, like their anceſtors the Sitones; and, beſides oars, added the improvement of two ſails; and victualled them with ſalted proviſions, biſcuit, cheeſe, and beer. Their ſhips were at firſt ſmall; but in after times they were large enough to hold 100 or 120 men. But the multitude of veſſels was amazing. The fleet of Harold Blaatand conſiſted of 700. A hundred thouſand of theſe ſavages have at once ſailed from Scandinavia, ſo juſtly ſtyled *Officina gentium, aut certè velut vagina nationum.* Probably neceſſity, more than ambition, cauſed them to diſcharge their country of its exuberant numbers. Multitudes were deſtroyed; but multitudes remained, and peopled more favourable climates.

"Their king, Olaus, was a convert to Chriſtianity in 994; Bernard an Engliſhman had the honour of baptizing him, when Olaus happened to touch at one of the Scilly iſlands. He plundered with great ſpirit during ſeveral years; and in 1006 received the crown of martyrdom from his pagan ſubjects. But religious zeal firſt gave the reſt of Europe a knowledge of their country and the ſweets of its commerce. The Hanſe towns poured in their miſſionaries, and reaped a temporal harveſt. By the year 1204, the merchants obtained from the wiſe prince Suer every encouragement to commerce; and by that means introduced wealth and civilization into his barren kingdom. England by every method cheriſhed the advantages reſulting from an intercourſe with Norway, and Bergen was the emporium. Henry III. in 1217, entered into a league with its monarch Haquin; by which both princes ſtipulated for free acceſs for their ſubjects into their reſpective kingdoms, free trade, and ſecurity to their perſons. In 1269, Henry entered into another treaty with Magnus; in which it was agreed, that no goods ſhould be exported from either kingdom except they had been paid for; and there is, beſides a humane proviſion on both ſides, for the ſecurity of the perſons and effects of the ſubjects who ſhould ſuffer ſhipwreck on their ſeveral coaſts."

The inhabitants now ſpeak the ſame language that is uſed in Denmark, though their original tongue is the dialect now ſpoken in Iceland. They profeſs the Lutheran religion, under an archbiſhop eſtabliſhed at Drontheim, with four ſuffragans; namely, of Bergen, Staffanger, Hammer, and Chriſtiana. By the union of Calmar, the two kingdoms of Norway and Denmark were united under one monarch; and then the people of both nations enjoyed conſiderable privileges: but the Daniſh government ſoon became abſolute; and Norway was ruled deſpotically by a viceroy, who reſided in the capital, and preſided in the ſupreme court, to which appeals were made from the ſubordinate courts of judicature. A great change has, however, taken place ſince the preſent amiable and accompliſhed prince of Denmark had part of the government; and more may be expected from his virtue and aſſiduity when the power ſhall come wholly into his own hands.

The Norwegians are generally well formed, tall, ſturdy, and robuſt, brave, hardy, honeſt, hoſpitable, and ingenious; yet ſavage, raſh, quarrelſome, and litigious. The ſame character will nearly ſuit the inhabitants of every mountainous country in the northern climates. Their women are well ſhaped, tall, comely, remarkably fair, and obliging. The nobility of Norway have been chiefly removed by the kings of Denmark, in order [illegible] prevent faction and oppoſition to the court; or are [illegible] degenerated into the rank of peaſants: ſome [illegible], however, have been lately raiſed to that dig[illegible] Every freeholder in Norway enjoys the right of primogeniture and power of redemption; and it is very uſual to ſee a peaſant inhabiting the ſame houſe which has been poſſeſſed 400 years by his anceſtors. The *odels-gads*, or freehold, cannot be alienated by ſale or otherwiſe from the right heir, called *odels-mand*: if he is not able to redeem the eſtate, he declares his incapacity every 10th year at the ſeſſions; and if he, or his heirs to the third generation, ſhould acquire wealth enough for that purpoſe, the poſſeſſor *pro tempore* muſt reſign his poſſeſſion.

The mountaineers acquire ſurpriſing ſtrength and dexterity by hard living, cold, laborious exerciſe, climbing rocks, ſkating on the ſnow, and handling arms, which they carry from their youth to defend themſelves againſt the wild beaſts of the foreſt. Thoſe who dwell in the maritime parts of Norway exerciſe the employments of fiſhing and navigation, and become very expert mariners.

The peaſants of Norway never employ any handicraftſmen for neceſſaries to themſelves and families: they are their own hatters, ſhoemakers, taylors, tanners, weavers, carpenters, ſmiths, and joiners: they are even expert at ſhip-building; and ſome of them make excellent violins. But their general turn is for carving in wood, which they execute in a ſurpriſing manner with a common knife of their own forging. They are taught in their youth to wreſtle, ride, ſwim, ſkate, climb, ſhoot, and forge iron. Their amuſements conſiſt in making verſes, blowing the horn, or playing upon a kind of guitar, and the violin: this laſt kind of muſic they perform even at funerals. The Norwegians have evinced their valour and fidelity in a thouſand different inſtances. The country was always diſtracted by inteſtine quarrels, which raged from generation to generation. Even the farmers ſtand upon their punctilio, and challenge one another to ſingle combat with their knives. On ſuch occaſions they hook themſelves together by their belts, and fight until one of them is killed or mortally wounded. At weddings and public feaſts they drink to intoxication, quarrel, fight, and murder generally enſues. The very common people are likewiſe paſſionate, ambitious of glory and independence, and vain of their pedigree. The nobility and merchants of Norway fare ſumptuouſly; but the peaſant lives with the utmoſt temperance and frugality, except at feſtivals: his common bread is made of oatmeal, rolled into broad thin cakes, like thoſe uſed in Scotland. In time of ſcarcity, they boil, dry, and grind the bark of the fir tree into a kind of flour which they mix with oat meal; the bark of the elm tree is uſed in the ſame manner. In thoſe parts where a fiſhery is carried on, they knead the roes of cod with their oat meal. Of theſe laſt, mixed with barley meal, they make haſty pudding and ſoup, enriched with a pickled herring or ſalted mackarel. Freſh fiſh they have in plenty on the ſea coaſt. They hunt and eat grouſe, partridge, hare, red deer, and rein-deer. They kill cows, ſheep, and goats, for their winter ſtock: theſe they pickle, or ſmoke, or dry for uſe. They make cheeſe of their milk, and a liquor called *ſyre* of their ſour whey: [illegible] they commonly drink mixed with water; but th[illegible]ide a ſtore of ſtrong ale for Chriſtmas, weddings, chriſtenings, and other entertainments. From their temperance and exercife, joined to the purity and elaſticity of their air, they enjoy good health, and often attain to a ſurpriſing degree of longevity. Nothing is more common than to ſee a hearty Norwegian turned of 100. In the year 1733, four couples danced before his Daniſh majeſty at Frederickſhall: their ages, when joined, exceeded 800 years. Nevertheleſs, the Norwegians are ſubject to various diſeaſes; ſuch as the ſcab, the leproſy, the ſcurvy, the catarrh, the rheumatiſm, gout, and epilepſy. The dreſs of the Norway peaſants conſiſts of a wide looſe jacket made of coarſe cloth, with waiſtcoat and breeches of the ſame. Their heads are covered with flapped hats, or caps ornamented with ribbons. They wear ſhoes without outer ſoles, and in the winter leathern buſkins. They have likewiſe ſnow ſhoes and long ſkates, with which they travel at a great pace, either on the land or ice. There is a corps of ſoldiers thus accoutred, who can outmarch the ſwifteſt horſes. The Norwegian peaſant never wears a neckcloth, except on extraordinary occaſions: he opens his neck and breaſt to the weather, and lets the ſnow beat into his boſom. His body is girt round with a broad leathern belt, adorned with braſs plates, from which depends a braſs chain that ſuſtains a large knife, gimlet, and other tackle. The women are dreſſed in cloſe laced jackets, having leathern girdles decorated with ornaments of ſilver. They likewiſe wear ſilver chains round their necks, to the ends of which are fixed gilt medals. Their caps and handkerchiefs are almoſt covered with ſmall plates of ſilver, braſs, and tin, large rings, and buttons. A maiden bride appears with her hair plaited, and, together with her clothes, hung full of ſuch jingling trinkets.

The churches, public edifices, and many private houſes in Norway, are built of ſtone: but the people in general live in wooden houſes, made of the trunks of fir and pine tree laid upon each other, and joined by mortiſes at the corners. Theſe are counted more dry, warm, and healthy, than ſtone or brick buildings. In the whole dioceſe of Bergen, one hardly ſees a farm houſe with a chimney or window: they are generally lighted by a ſquare hole in the top of the houſe, which lets in the light, and lets out the ſmoke. In ſummer this hole is left quite open: in the winter, it is covered with what they call a *ſiau;* that is the membrane of ſome animal, ſtretched upon a wooden frame that fits the hole, and tranſmits the rays of light. It is fixed or removed with a long pole occaſionally. Every perſon that enters the houſe, upon buſineſs or [illegible], takes hold of this pole, according to an[illegible] cuſtom. The ceiling is about eight feet high in the middle; and, being arched like a cupola, the ſmoke of the fire underneath rolls about, until it finds a vent at the hole, which is called *liur*. Under this opening ſtands a thick table with benches, and a high ſeat at the upper end for the maſter of the family: he has likewiſe a ſmall cupboard for his own uſe, in which he locks up his moſt valuable effects. The boards of the roof are coated with the bark of the birch trees, which is counted incorruptible: this again is covered with turf, which yields a good crop of graſs for goats and ſheep, and is often mowed as hay by the farmer.

The Norwegians carry on a conſiderable trade with foreign nations. The duty on the produce of their own country exported, amounts annually to 100,000 rixdollars. Theſe commodities are, copper wrought and unwrought; iron caſt into cannon, ſtoves, and pots, or forged into bars; lead, in ſmall quantity; maſts, timber, deal boards, planks, marble, millſtones, herring, cod, ling, ſalmon, lobſters, flounders, cow hides, goat ſkins, ſeal ſkins, the furs of bears, wolves, foxes, beavers, ermines, martens, &c. down, feathers, butter, tallow, train oil, tar, juniper and other ſorts of berries, and nuts; ſalt, alum, glaſs, vitriol, and pot aſhes. All other commodities and articles of luxury the Norwegians import from different nations. The nature of the ground does not admit of much improvement in agriculture: nevertheleſs, the farmers are not deficient in induſtry and ſkill to drain marſhes, and render the ground arable and fit for paſture. Many are employed in grazing and breeding cattle; but a much greater number is engaged in felling wood, floating timber, burning charcoal, and extracting tar from the roots of the trees which have been cut down in the ſilver, copper, and iron mines; in the navigation and fiſhery. A conſiderable number of people earn a comfortable livelihood by hunting, ſhooting, and bird catching. Every individual is at liberty to purſue the game, eſpecially in the mountains and commons: therefore every peaſant is expert in the uſe of fire arms; and there are excellent markſmen among the mountains, who make uſe of the bow to kill thoſe animals, whoſe ſkins, being valuable, would be damaged by the ſhot of fire arms.

Norway can produce above 14,000 excellent ſeamen. The army of this country amounts to 30,000 effective men; and the annual revenue exceeds 800,000 rixdollars.

NORWAY Rat, in zoology. See MUS.

NORWICH, the capital of the county of Norfolk in England, ſituated in E. Long. 1. 26. N. Lat. 52. 40. It is ſuppoſed to have had its name, which ſignifies "a caſtle to the north," from its ſituation in reſpect of Caſtor, the ancient Venta Icenorum, three or four miles to the ſouth of it, out of whoſe ruins it ſeems to have riſen. In its infancy, in the reign of Etheldred, it was plundered and burnt by Sueno the Dane, when he invaded England with a great army. Afterwards it recovered; and in the reign of Edward warded by the Romans for the important ſervices he had done them. As for Syphax, after the loſs of his dominions, he was kept in confinement for ſome time at Alba; from whence being removed in order to grace Scipio's triumph, he died at Tibur in his way to Rome. Zonaras adds, that his corpſe was decently interred; that all the Numidian priſoners were releaſed; and that Vermina, by the aſſiſtance of the Romans, took peaceable poſſeſſion of his father's throne. However, part of the Maſſæſylian kingdom had been before annexed to Maſiniſſa's dominions, in order to reward that prince for his ſingular fidelity and cloſe [illegible] to the Romans.

This ſeems to be countenanced by the [illegible] of Livy, who gives us ſufficiently to underſtand [illegible] phax's family, for a conſiderable time after the concluſion of the ſecond Punic war, reigned in one part of Numidia. For he intimates, that Archobarzanes, Syphax's grandſon, and probably Vermina's ſon, hovered with a powerful army of Numidians upon the Carthaginian frontiers a few years before the beginning of the third Punic war. This he ſeems to have done, either in order to cover them, or to enable the Carthaginians to make an irruption into Maſiniſſa's territories. Cato, however, pretended that theſe forces, in conjunction with thoſe of Carthage, had a deſign to invade the Roman dominions, which he urged as a reaſon to induce the conſcript fathers to deſtroy the African republic.

Nothing is further requiſite, in order to complete the hiſtory of this famous prince, than to exhibit to our readers view ſome point of his conduct towards the decline, and at the cloſe, of life; the wiſe diſpoſitions made after his death by Æmilianus, in order to the regulation of his domeſtic affairs; and ſome particulars relating to his character, genius, and habit of body, drawn from the moſt celebrated Greek and Roman authors.

By drawing a line of circumvallation around the Carthaginian army under Aſdrubal, poſted upon an eminence, Maſiniſſa cut off all manner of ſupplies from them; which introduced both the plague and famine into their camp. As the body of Numidian troops employed in this blockade was not near ſo numerous as the Carthaginian forces, it is evident, that the line here mentioned muſt have been extremely ſtrong, and conſequently the effect of great labour and art. The Carthaginians, finding themſelves reduced to the laſt extremity, concluded a peace upon the following terms, which Maſiniſſa dictated to them: 1. That they ſhould deliver up all deſerters. 2. That they ſhould recal their exiles, who had taken refuge in his dominions. 3. That they ſhould pay him 5000 talents of ſilver within the ſpace of 50 years. 4. That their ſoldiers ſhould paſs under the jugum, each of them carrying off only a ſingle garment. As Maſiniſſa himſelf, though between 80 and 90 years of age, conducted the whole enterpriſe, he muſt have been extremely well verſed in fortification, and other branches of the military art. His underſtanding likewiſe he muſt have retained to the laſt. This happened a ſhort time before the beginning of the third Punic war. See CARTHAGE.

Soon after, the conſuls landed an army in Africa, in order to lay ſiege to Carthage, without imparting to Maſiniſſa their deſign. This not a little chagrined him, as it was contrary to the former practice of the Romans; who in the preceding war had communicated their intentions to him, and conſulted him on all occaſions. When, therefore, the conſuls applied to him for a body of his troops to act in concert with their forces, he made anſwer, "That they ſhould have a reinforcement from him when they ſtood in need of it." It could not but be provoking to him to conſider, that after he had extremely weakened the Carthaginians, and even brought them to the brink of ruin, his pretended imperious friends ſhould come to reap the fruits of his victory, without giving him the leaſt intelligence of it.

5
Maſiniſſa diſpleaſed with the Romans;

However, his mind ſoon returned to its natural bias, which was in favour of the Romans. Finding his end approaching, he ſent to Æmilianus, then a tribune in the Roman army, to deſire a viſit from him. What he propoſed by this viſit, was to inveſt him with full powers to diſpoſe of his kingdom and eſtate as he ſhould think proper, for the benefit of his children. The high idea he had entertained of that young hero's abilities and integrity, together with his gratitude and affection for the family into which he was adopted, induced him to take this ſtep. But, believing that death would not permit him to have a perſonal conference with Æmilianus upon this ſubject, he informed his wife and children in his laſt moments, that he had empowered him to diſpoſe in an abſolute manner of all his poſſeſſions, and divide his kingdom amongſt his ſons. To which he ſubjoined, "I require, that whatever Æmilianus may decree, ſhall be executed as punctually as if I myſelf had appointed it by my will." Having uttered theſe words, he expired, at about 90 years of age.

6
but leaves every thing to the diſpoſal of Æmilianus

This prince, during his youth, had met with ſtrange reverſes of fortune. However, ſays Appian, being ſupported by the Divine protection, he enjoyed an uninterrupted courſe of proſperity for a long ſeries of years. His kingdom extended from Mauritania to the weſtern confines of Cyrenaica; from whence it appears, that he was one of the moſt powerful princes of Africa. Many of the inhabitants of this vaſt tract he civilized in a wonderful manner, teaching them to cultivate their ſoil, and to reap thoſe natural advantages which the fertility of ſome parts of their country offered them. He was of a more robuſt habit of body than any of his cotemporaries, being bleſſed with the greateſt health and vigour; which was doubtleſs owing to his extreme temperance, and the toils he inceſſantly ſuſtained. We are informed by Polybius, that ſometimes he ſtood upon the ſame ſpot of ground from morning till evening, without the leaſt motion, and at others continued as long in a ſitting poſture. He would remain on horſeback for ſeveral days and nights together, without being ſenſible of the leaſt fatigue. Nothing can better evince the ſtrength of his conſtitution, than his youngeſt ſon, named *Stembal*, *Sthemba*, or *Stemlanus*, who was but four years old at his deceaſe. Though 90 years of age, he performed all the exerciſes uſed by young men, and always rode without a ſaddle. Pliny tells us, that he reigned above 60 years. He was an able commander, and much facilitated the reduction of Carthage. Plutarch from Polybius obſerves, that the day after a great victory won over the Carthaginians, Maſiniſſa was ſeen ſitting at door of his tent, eating a piece of brown bread. Suidas relates, that to the laſt he could mount his horſe without any aſſiſtance. According to Appian he left a numerous well diſciplined army, and an immenſe quantity of wealth, behind him.

Maſiniſſa, before his death, gave his ring to his eldeſt ſon Micipſa; but left the diſtribution of all his other effects and poſſeſſions amongſt his children entirely to Æmilianus. Of 54 ſons that ſurvived him, only three were legitimate, to wit, Micipſa, Guluſſa, and Maſtanabal. Æmilianus, arriving [illegible] after he had expired, divided his kingdom, or rather the government of it, among theſe three, though to the others he gave conſiderable poſſeſſions. To Micipſa, who was a prince of a pacific diſpoſition, and the eldeſt ſon, he aſſigned Cirta, [illegible] metropolis, for the place of his reſidence, in excluſion of the others. Guluſſa, the next to him, being a prince of a military genius, had the command of the army, and the tranſacting of all affairs relating to peace [illegible]r committed to his care. And Manaſtabal, the youngeſt, had the adminiſtration of juſtice, an employment ſuitable to his education, allotted him. They enjoyed in common the immenſe treaſures Maſiniſſa had amaſſed, and were all of them dignified by [illegible]milianus with the royal title. After he had made theſe wiſe diſ[illegible], that young nobleman departed from Cirta, taking with him a body of Numidian troops, under the conduct of Guluſſa, to reinforce the Roman army that was then acting againſt the Carthaginians.

Maſtanabal and Guluſſa died ſoon after their father, as appears from the expreſs teſtimony of Salluſt. We find nothing more remarkable of theſe princes, beſides what has been already related, than that the latter continued to aſſiſt the Romans in the third Punic war, and that the former was pretty well verſed in the Greek language. Micipſa therefore became ſole poſſeſſor of the kingdom of Numidia. In his reign, and under the conſulate of M. Plautius Hypſæus and M. Fulvius Flaccus, according to Oroſius, a great part of Africa was covered with locuſts, which deſtroyed all the produce of the earth, and even devoured dry wood. But at laſt they were all carried by the wind into the African ſea, out of which being thrown in vaſt heaps upon the ſhore, a plague enſued, which ſwept away an infinite number of animals of all kinds. In Numidia only 800,000 men periſhed, and in Africa Propria 200,000; amongſt the reſt, 30,000 Roman ſoldiers quartered in and about Utica for the defence of the latter province. At Utica, in particular, the mortality raged to ſuch a degree, that 1500 dead bod[illegible] were carried out of one gate in a day. Micipſa had two ſons, Adherbal and Hiempſal, whom he educated in his palace, together with his nephew Jugurtha. That young prince was the ſon of Maſtanabal; but his mother having been only a concubine, Maſiniſſa had taken no great notice of him. However, Micipſa conſidering him as a prince of the blood, took as much care of him as he did of his own children.

7 History of Jugurtha.

Jugurtha poſſeſſed ſeveral eminent qualities, which gained him univerſal eſteem. He was very handſome, endued with great ſtrength of body, and adorned with the fineſt intellectual endowments. He did not devote himſelf, as young men commonly do, to a life of luxury and pleaſure. He uſed to exerciſe himſelf, with perſons of his age, in running, riding, hurling javelin, and other manly exerciſes, ſuited to the martial genius of the Numidians, and though he ſurpaſſed all his fellow ſportſmen, there was not one of them but loved him. The chaſe was his only delight; but it [illegible] that of lions and other ſavage beaſts. Salluſt, to [illegible] his character, tells us, that he excelled in all [illegible] ſpoke very little of himſelf.

[illegible]us an aſſemblage of fine talents and per[illegible] firſt charmed Micipſa, who thought them an ornament to his kingdom. However, he ſoon began to reflect, that he was conſiderably advanced in [illegible] children in their infancy; that mankind [illegible]rſted after power, and that nothing was [illegible]ing men run greater lengths than a vi[illegible] unlimited ambition. Theſe reflections ſoon [illegible] jealouſy, and determined him to expoſe Jugurtha to a variety of dangers, ſome of which, he entertained hopes, might prove fatal to him. In order to this, he gave him the command of a body of forces which he ſent to aſſiſt the Romans, who were at that time beſieging Numantia in Spain. But Jugurtha, by his admirable conduct, not only eſcaped all thoſe dangers, but likewiſe won the eſteem of the whole army, and the friendſhip of Scipio, who ſent a high character of him to his uncle Micipſa. However, that general gave him ſome prudent advice in relation to his future conduct; obſerving, no doubt, in him certain ſparks of ambition, which, if lighted into a flame, he apprehended might one day be productive of the moſt fatal conſequences.

8 Is dreaded by King Micipſa,

Before this laſt expedition, Micipſa had endeavoured to find out ſome method of taking him off privately; but his popularity amongſt the Numidians obliged that prince to lay aſide all thoughts of this nature. After his return from Spain the whole nation almoſt adored him. The heroic bravery he had ſhown there, his undaunted courage, joined to the utmoſt calmneſs of mind, which enabled him to preſerve a juſt medium between a timorous foreſight and an impetuous raſhneſs, a circumſtance rarely to be met with in perſons of his age, and above all the advantageous teſtimonials of his conduct given by Scipio, attracted an univerſal eſteem. Nay, Micipſa himſelf, charmed with the high opinion the Roman general had entertained of his merit, changed his behaviour towards him; reſolving, if poſſible, to win his affection by kindneſs. He therefore adopted him, and declared him joint heir with his two ſons to the crown. Finding, ſome few years afterwards, that his end approached, he ſent for all three to his bed ſide, where, in the preſence of the whole court, he deſired Jugurtha to recollect with what extreme tenderneſs he had treated him, and conſequently to conſider how well he had deſerved at his hands.

9 who nevertheleſs intruſts him with the care of his children,

He then entreated him to protect his children on all occaſions, who, being before related to him by the ties of blood, were now by their father's bounty be[illegible] his brethren. In order to fix him the more firmly [illegible]ir intereſt, he likewiſe complimented him upon his bravery, addreſs, and conſummate prudence. He further inſinuated, that neither arms nor treaſures conſtitute the ſtrength of a kingdom; but friends, who are neither won by arms nor gold, but by real ſervices and an inviolable fidelity. "Now, where (continued he) he) can we find better friends than in brothers? And how can that man who becomes an enemy to his relations, repoſe any confidence in, or depend upon ſtrangers?" Then addreſſing himſelf to Adherbal and Hiempſal, "And you (ſaid he) I enjoin always to pay the higheſt reverence to Jugurtha. Endeavour to imitate, and if poſſible ſurpaſs, his exalted merit, that the world may not hereafter obſerve Micipſa's adopted ſon to have reflected greater glory upon his memory than his own children." Soon after, Micipſa, who, according to Diodorus, was a prince of an amiable character, expired. Though Jugurtha did not believe the king to ſpeak his real ſentiments with regard to him, yet he ſeemed extremely pleaſed with ſo gracious [illegible], and made him an anſwer ſuitable to th[illegible] However, that prince at the ſame time was d[illegible] within himſelf to put in execution the ſcheme [illegible] formed at the ſiege of Numantia, which was ſuggeſt[illegible] to him by ſome factious and abandoned Roman officers, with whom he there contracted an acquaintance. The purport of this ſcheme was, that he ſhould extort the crown by force from his two couſins, as ſoon as their father's eyes were cloſed; which they inſinuated might eaſily be effected by his own valour, and the venality of the Romans. Accordingly, a ſhort time after the old king's death, he found means to aſſaſſinate Hiempſal in the city of Thirmida where his treaſures were depoſited, and drive Adherbal out of his dominions. That unhappy prince found himſelf obliged to fly to Rome, where he endeavoured to engage the conſcript fathers to eſpouſe his quarrel; but, notwithſtanding the juſtice of his cauſe, they had not virtue enough effectually to ſupport him. Jugurtha's ambaſſadors, by diſtributing vaſt ſums of money amongſt the ſenators, brought them ſo far over, that a majority palliated his inhuman proceedings. This encouraged thoſe miniſters to declare, that Hiempſal had been killed by the Numidians on account of his exceſſive cruelty; that Adherbal was the aggreſſor in the late troubles; and that he was only chagrined becauſe he could not make that havock among his countrymen he would willingly have done. They therefore entreated the ſenate to form a judgment of Jugurtha's behaviour in Africa from his conduct at Numantia, rather than from the ſuggeſtions of his enemies. Upon which, by far the greateſt part of the ſenate diſcovered themſelves prejudiced in his favour. A few, however, that were not loſt to honour, nor abandoned to corruption, inſiſted upon bringing him to condign puniſhment. But as they could not prevail, he had the beſt part of Numidia allotted him, and Adherbal was forced to reſt ſatisfied with the other.

10
one of whom he murders, and drives out the other.

11
enality of e Ro- s.

Jugurtha finding now by experience that every thing was venal at Rome, as his friends at Numantia had before informed him, thought he might purſue his towering projects without any obſtruction from that quarter. He therefore, immediately after the laſt diviſion of Micipſa's dominions, threw off the maſk, [illegible] attacked his couſin by open force. As Adherbal [illegible] a prince of a pacific diſpoſition, and almoſt in a[illegible] ſpects the reverſe of Jugurtha, he was by no means a match for him. The latter therefore pillaged the former's territories, ſtormed ſeveral of his fortreſſes, and overran a good part of his kingdom without oppoſition. Adherbal, depending on the friendſhip of the Romans, which his father in his laſt moments aſſured him would be a ſtronger ſupport to him than all the troops and treaſures in the univerſe, deſpatched deputies to Rome to complain of theſe hoſtilities. But whilſt he loſt his time in ſending thither fruitleſs deputations, Jugurtha overthrew him in a pitched battle, and ſoon after ſhut him up in Cirta. During the ſiege of this city, a Roman commiſſion arrived there, in order to perſuade both parties to an accommodation; but finding Jugurtha untractable, the commiſſioners returned home without ſo much as conferring with Adherbal. A ſecond deputation, compoſed of ſenators of the higheſt diſtinction, with Æmilius Scaurus, preſident of the [illegible] their head, landed ſome time after at Utica, and ſummoned Jugurtha to appear before them. That prince, at firſt ſeemed to be under dreadful apprehenſions, eſpecially as Scaurus reproached him with his enormous crimes, and threatened him with the reſentment of the Romans if he did not immediately [illegible]ſe the ſiege of Cirta. However, the Nu[illegible], by his addreſs, and the irreſiſtible power of [illegible] was afterwards ſuſpected at Rome, ſo molli[illegible], that he left Adherbal at his mercy. In [illegible] Jugurtha had at laſt Cirta ſurrendered to him, upon condition only that he ſhould ſpare the life of Adherbal. But the mercileſs tyrant, in violation of the laws of nature and humanity as well as the capitulation, when he had got poſſeſſion of the town, ordered him to be put to a moſt cruel death. The merchants likewiſe, and all the Numidians in the place capable of bearing arms, he cauſed without diſtinction to be put to the ſword.

Every perſon at Rome inſpired with any ſentiments of humanity, was ſtruck with horror at the news of this tragical event. However, all the venal ſenators ſtill concurred with Jugurtha's miniſters in palliating his enormous crimes. Notwithſtanding which, the people, excited thereto by Caius Memmius their tribune, who bitterly inveighed againſt the venality of the ſenate, reſolved not to let ſo flagrant an inſtance of villany go unpuniſhed. This diſpoſition in them induced the conſcript fathers likewiſe to declare their intention to chaſtiſe Jugurtha. In order to this, an army was levied to invade Numidia, and the command of it given to the conſul Calpurnius Beſtia, a perſon of good abilities, but rendered unfit for the expedition he was to go upon by his inſatiable avarice. Jugurtha being informed of the great preparations making at Rome to attack his dominions, ſent his ſon thither to avert the impending ſtorm. The young prince was plentifully ſupplied with money, which he had orders to diſtribute liberally amongſt the leading men. But Beſtia, propoſing to himſelf great advantages from an invaſion of Numidia, defeated all his intrigues, and got a decree paſſed, ordering him and his attendants to depart Italy in ten days, unleſs they were come to deliver up the king himſelf, and all his territories, to the republic by way of dedition. Which decree being [illegible]tified to them, they returned without ſo much as [illegible]aving entered the gates of Rome; and the conſul ſoon after landed with a powerful army in Africa. For ſome time he carried on the war there very briſkly, reduced ſeveral ſtrong holds, and took many Numidians priſoners. But upon the arrival of Scaurus, a peace was granted Jugurtha upon advantageous terms.

That

Numidia. That prince coming from Vacca, the place of his reſidence, to the Roman camp, in order to confer with Beſtia and Scaurus, and the preliminaries of the treaty being immediately after ſettled between them in private conferences, every body at Rome was convinced that the prince of the ſenate and the conſul had to their avarice ſacrificed the republic. The indignation thereof of the people in general diſplayed itſelf in the ſtrongeſt manner. Memmius alſo fired them with his ſpeeches. It was therefore reſolved to deſpatch the prætor Caſſius, a perſon they could confide in, to Numidia, to prevail upon Jugurtha to come to Rome, that they might learn from the king himſelf which of their generals and ſenators had been ſeduced by the peſtilent influence of corruption. Upon his arrival there, he found means to bribe one Bæbius Salca, a man of great authority amongſt the plebeians, but of inſatiable avarice, by whoſe aſſiſtance he eſcaped with impunity. Nay, by the efficacy of gold, he not only eluded all the endeavours of the people of Rome to bring him to juſtice, but likewiſe enabled Bomilcar, one of his attendants, to get Maſſiva, an [illegible] ſon of Micipſa, aſſaſſinated in the ſtreets of [illegible]. That young prince was adviſed by many Romans of probity, wellwiſhers to the family of Maſiniſſa, to apply for the kingdom of Numidia; which coming to Jugurtha's ears, he prevented the application by this execrable ſtep. However, he was obliged to leave Italy immediately.

Jugurtha had ſcarce ſet foot in Africa, when he received advice that the ſenate had annulled the ſhameful peace concluded with him by Beſtia and Scaurus. Soon after, the conſul Albinus tranſported a Roman army into Numidia, flattering himſelf with the hopes of reducing Jugurtha to reaſon before the expiration of his conſulate. In this, however, he found himſelf deceived; for that crafty prince, by various artifices ſo amuſed and impoſed upon Albinus, that nothing of moment happened that campaign. This rendered him ſtrongly ſuſpected of having betrayed his country, after the example of his predeceſſors. His brother Aulus, who ſucceeded him in the command of the army, was ſtill more unſucceſsful; for after riſing from before Suthul, where the king's treaſures were depoſited, he marched his forces into a defile out of which he found it impoſſible to extricate himſelf. He therefore was obliged to ſubmit to the ignominious ceremony of paſſing under the *jugum*, with all his men, and to quit Numidia entirely in ten days time, in order to deliver his troops from immediate deſtruction. The avaricious diſpoſition of the Roman commander had prompted him to beſiege Suthul, the poſſeſſion of which place he imagined would make him maſter of all the wealth of Jugurtha, and conſequently paved the way to ſuch a ſcandalous treaty. However, this was declared void as ſoon as known at Rome, as being concluded without the authority of the people. The Roman troops retired into Africa Propria, which they had now reduced into the form of a Roman province, and there took up their winter quarters.

In the mean time Caius Mamillius Limetanus, tribune of the people, excited the plebeians to inquire into the conduct of thoſe perſons by whoſe aſſiſtance Jugurtha had found means to elude all the decrees of the ſenate. This put the body of the people into a great ferment, which occaſioned a proſecution of the guilty ſenators, that was carried on, for ſome time, with the utmoſt heat and violence. Lucius Metellus the conſul, during theſe tranſactions, had Numidia aſſigned him for his province, and conſequently was appointed general of the army deſtined to act againſt Jugurtha. As he perfectly diſregarded wealth, the Numidian found him ſuperior to all his temptations; which was a great mortification to him. To this he joined all the other virtues which conſtitute the great captain; ſo that Jugurtha found him in all reſpects inacceſſible. That prince therefore was now forced to regulate his conduct according to the motions of Metellus with the greateſt caution; and to exert his utmoſt bravery, in order to compenſate for that hitherto ſo favourable expedient which now began to fail him. Marius, Metellus's lieutenant, being likewiſe a perſon of uncommon merit, the Romans reduced Vacca, a large opulent city, and the moſt celebrated mart in Numidia. They alſo defeated Jugurtha in a pitched battle; overthrew Bomilcar, one of his generals, upon the banks of the Muthullus; and, in fine, forced the Numidian monarch to take ſhelter in a place rendered almoſt inacceſſible by the rocks and woods with which it was covered. However, Jugurtha ſignalized himſelf in a ſurpriſing manner, exhibiting all that could be expected from the courage, abilities, and attention of a conſummate general, to whom deſpair adminiſters freſh ſtrength, and ſuggeſts new lights. But his troops could not make head againſt the Romans; they were again worſted by Marius, though they obliged Metellus to raiſe the ſiege of Zama. Jugurtha therefore, finding his country everywhere ravaged, his moſt opulent cities plundered, his fortreſſes reduced, his towns burnt, vaſt numbers of his ſubjects put to the ſword and taken priſoners, began to think ſeriouſly of coming to an accommodation with the Romans. His favourite Bomilcar, in whom he repoſed the higheſt confidence, but who had been gained over to the enemy by Metellus, obſerving this diſpoſition, found it no difficult matter to perſuade him to deliver up his elephants, money, arms, horſes, and deſerters, in whom the main ſtrength of his army conſiſted, into the hands of the Romans. Some of theſe laſt, in order to avoid the puniſhment due to their crime, retired to Bocchus king of Mauritania, and liſted in his ſervice. But Metellus ordering him to repair to Tiſidium, a city of Numidia, there to receive farther directions, and he refuſing a compliance with that order, hoſtilities were renewed with greater fury than ever. Fortune now ſeemed to declare in favour of Jugurtha: he retook Vacca, and maſſacred all the Roman garriſon, except Turpilius the commandant. However, ſoon after, a Roman legion ſeized again upon it, and treated the inhabitants with the utmoſt ſeverity. About this time, one of Maſtanabal's ſons, named *Gauda*, whom Micipſa in his will had appointed to ſucceed to the crown in caſe his two legitimate ſons and Jugurtha died without [illegible] to the ſenate in favour of Marius, who [illegible] to ſupplant Metellus. That prince [illegible] ſtanding impaired by a declining ſtate of [illegible] a more eaſy prey to the baſe and infamous adulation of Marius. The Roman, ſoothing his vanity, aſſured him, that as he was the next heir to the crown, he might depend upon being

Numidia.

12 Metellus ſent againſt Jugurtha.

13 Who is betrayed by Bomilcar.

fixed upon the Numidian throne, as ſoon as Jugurtha was either killed or taken; and that this would in a ſhort time happen, when once he appeared at the head of the Roman army with an unlimited commiſſion. Soon after, Bomilcar and Nabdalſa formed a deſign to aſſaſſinate Jugurtha, at the inſtigation of Metellus; but this being detected, Bomilcar and moſt of his accomplices ſuffered death. The plot however had ſuch an effect upon Jugurtha, that he enjoyed afterwards no tranquillity or repoſe. He ſuſpected perſons of all denominations, Numidians as well as foreigners, of ſome black deſigns againſt him. Perpetual terrors ſat brooding over his mind; inſomuch that he never got a wink of ſleep but by ſtealth, and often changed his bed in a low plebeian manner. Starting from his ſleep, he would frequently ſnatch his ſword, and break out into the moſt doleful cries: So ſtrongly was he haunted by a ſpirit of fear, jealouſy, and diſtraction!

14 A conſpiracy againſt him.

Jugurtha having deſtroyed great numbers of his friends on ſuſpicion of their having been concerned in the late conſpiracy, and many more of them deſerting to the Romans and Bocchus king of Mauritania, he found himſelf, in a manner, deſtitute of counſellors, generals, and all perſons capable of aſſiſting him in carrying on the war. This threw him into a deep melancholy, which rendered him diſſatisfied with every thing, and made him fatigue his troops with a variety of contradictory motions. Sometimes he would advance with great celerity againſt the enemy, and at others retreat with no ſmall ſwiftneſs from them. Then he reſumed his former courage; but ſoon after deſpaired either of the valour or fidelity of the forces under his command. All his movements therefore proved unſucceſsful, and at laſt he was forced by Metellus to a battle. That part of the Numidian army which Jugurtha commanded, behaved with ſome reſolution; but the other fled at the firſt onſet. The Romans therefore entirely defeated them, took all their ſtandards, and made a few of them priſoners. But few of them were ſlain in the action; ſince, as Salluſt obſerves, the Numidians truſted more to their heels than to their arms for ſafety in this engagement.

15 He is defeated by Metellus.

Metellus purſued Jugurtha and his fugitives to Thala. His march to this place being through vaſt deſerts, was extremely tedious and difficult. But being ſupplied with leathern bottles and wooden veſſels of all ſizes taken from the huts of the Numidians, which were filled with water brought by the natives, who had ſubmitted to him, he advanced towards that city. He had no ſooner begun his march, than a moſt copious ſhower of rain, a thing very uncommon in thoſe deſerts, proved a great and ſeaſonable refreſhment to his troops. This ſo animated them, that upon their arrival before Thala, they attacked the town with ſuch vigour, that Jugurtha with his family, and treaſures depoſited therein, thought proper to abandon it. After a brave defence, it was reduced; the garriſon, conſiſting of Roman deſerters, ſetting fire to the king's palace, and conſuming themſelves, together with every thing valuable to them, in the [illegible] gurtha, being now reduced to [illegible] tired [illegible] innumerable [illegible] to the confines of Mauritania; and engaged Bocchus king of that country, who had married his daughter, to enter into an alliance with him. In conſequence of which, having reinforced his Gætulian troops with a powerful body of Mauritanians, he turned the tables upon Metellus, and obliged him to keep cloſe within his entrenchments. Salluſt informs us, that Jugurtha bribed Bocchus's miniſters to influence that prince in his favour; and that having obtained an audience, he inſinuated, that, ſhould Numidia be ſubdued, Mauritania muſt be involved in its ruin, eſpecially as the Romans ſeemed to have vowed the deſtruction of all the thrones in the univerſe. In ſupport of what he advanced, he produced ſeveral inſtances very appoſite to the point in view. However, the ſame author ſeems to intimate, that Bocchus was determined to aſſiſt Jugurtha againſt his enemies by the ſlight the Romans had formerly ſhown him. That prince, at the firſt breaking out of the war, had ſent ambaſſadors to Rome, to propoſe an offenſive and defenſive alliance to the republic; which, though of the utmoſt conſequence to it at the juncture, a few of the moſt venal and infamous ſenators, who were abandoned to corruption, prevented from taking effect. This undoubtedly wrought more powerfully upon Bocchus in favour of Jugurtha, than the relation he ſtood in to him: For both the Moors and Numidians adapted the number of their wives to their circumſtances, ſo that ſome had 10, 20, &c. to their ſhare; their kings therefore were unlimited in this particular, and of courſe all degrees of affinity reſulting to them from marriage had little force. It is obſervable, that the poſterity of thoſe ancient nations have the ſame cuſtom prevailing amongſt them at this day.

Such was the ſituation of affairs in Numidia, when Metellus received advice of the promotion of Marius to the conſulate. But, notwithſtanding this injurious treatment, he generouſly endeavoured to draw off Bocchus from Jugurtha, though this would facilitate the reduction of Numidia for his rival. To this end ambaſſadors were deſpatched to the Mauritanian court, who intimated to Bocchus, "That it would be highly imprudent to come to a rupture with the Romans without any cauſe at all; and that he had now a fine opportunity of concluding a moſt advantageous treaty with them, which was much preferable to a war. To which they added, that whatever dependence he might place upon his riches, he ought not to run the hazard of loſing his dominions by embroiling himſelf with other ſtates, when he could eaſily avoid this; that it was much eaſier to begin a war than to end it, which it was in the power of the victor alone to do; that, in fine, he would by no means conſult the intereſt of his ſubjects if he followed the deſperate fortunes of Jugurtha." To which Bocchus replied, "That for his part there was nothing he wiſhed for more than peace; but that he could not help pitying the deplorable condition of Jugurtha; that if the Romans, therefore, would grant that unfortunate prince the ſame terms they had offered him, he would bring about an accommodation." Metellus, let the Mauritanian monarch know, that it was not in his power to comply with what he deſired. However, he took care to keep up a private negotiation with him till the new conſul Marius's arrival. By this conduct he ſerved two wiſe ends. Firſt, He prevented thereby Bocchus from coming to a general action with his

16 Marius ſucceeds Metellus.

troops; which was the very thing Jugurtha deſired, as hoping that this, whatever the event might be, would render a reconciliation betwixt him and the Romans impracticable. Secondly, This inaction enabled him to diſcover ſomething of the genius and diſpoſition of the Moors; a nation of whom the Romans, till then, had ſcarce formed any idea; which, he imagined, might be of no ſmall ſervice, either to himſelf or his ſucceſſors, in the future proſecution of the war.

Jugurtha, being informed that Marius, with a numerous army, was landed at Utica, adviſed Bocchus to retire, with part of the troops, to ſome place of difficult acceſs, whilſt he himſelf took poſt upon another inacceſſible ſpot with the remaining corps. By this meaſure, he hoped the Romans would be obliged to divide their forces, and conſequently be more expoſed to his efforts and attacks. He likewiſe imagined, that ſeeing no formidable body appear, they would believe the enemy in no condition to make head againſt them; which might occaſion a relaxation of diſcipline, the uſual attendant of a too great ſecurity, and conſequently produce ſome good effects. However, he was diſappointed in both theſe views. For Marius, far from ſuffering a relaxation of diſcipline to take place, trained up his troops, which conſiſted chiefly of new levies, in ſo perfect a manner, that they were ſoon equal in goodneſs to any conſular army that ever appeared in the field. He alſo cut off great numbers of the Gætulian marauders, defeated many of Jugurtha's parties, and had like to have taken that prince himſelf near the city of Cirta. These advantages, though not of any great importance, intimidated Bocchus, who now made overtures for an accommodation; but the Romans, not being ſufficiently ſatisfied of his ſincerity, paid no great attention to them. In the mean time Marius puſhed on his conqueſts, reducing ſeveral places of leſs note, and at laſt reſolved to beſiege Capſa. That this enterpriſe might be conducted with the greater ſecrecy, he ſuffered not the leaſt hint of his deſign to tranſpire, even amongſt any of his officers. On the contrary, in order to blind them, he detached A. Manlius, one of his lieutenants, with ſome light-armed cohorts, to the city of Lares, where he had fixed his principal magazine, and depoſited the military cheſt. Before Manlius left the camp, that he might the more effectually amuſe him, he intimated, that himſelf with the army ſhould take the ſame route in a few days: but inſtead of that, he bent his march towards the Tanais, and in ſix days time arrived upon the banks of that river. Here he pitched his tents for a ſhort time, in order to refreſh his troops; which having done, he advanced to Capſa, and made himſelf maſter of it. As the ſituation of this city rendered it extremely commodious to Jugurtha, whoſe plan of operations, ever ſince the commencement of the war, it had exceedingly favoured, he levelled it with the ground after it had been delivered up to the ſoldiers to be plundered. The citizens likewiſe, being more ſtrongly attached to that prince than any of the other Numidians, on account of the extraordinary privileges he indulged them with, and of courſe bearing a more implacable hatred to the Romans, he put to the ſword or ſold for ſlaves. The true motive of the conſul's conduct on this occaſion ſeems here to be aſſigned; though we are told by Salluſt, in conformity to the Roman genius, that neither avarice nor reſentment prompted him to ſo barbarous an action, but only a deſire to ſtrike a terror into the Numidians.

17 He gains a great advantage over Jugurtha.

The Numidians, ever after this exploit, dreaded the very name of Marius; who now, in his own opinion, had eclipſed the glory of all his predeceſſor's great atchievements, particularly the reduction of Thala, a city, in ſtrength and ſituation, nearly reſembling Capſa. Following this blow, he gradually preſented himſelf before moſt of the places of ſtrength in the enemy's country, many of which either opened their gates, or were [illegible], at his approach, being terrified with what had happened to the unfortunate citizens of Capſa. Others taken by force, he laid in aſhes; and in [illegible] filled the greateſt part of Numidia with blood, [illegible] and confuſion. Then, after an obſtinate defence, he reduced a caſtle that ſeemed impregnable, ſeated not far from Mulucha, where Jugurtha kept part of his treaſures. In the mean time, Jugurtha not being able to prevail upon Bocchus, by his repeated ſolicitations, to advance into Numidia, where he found himſelf greatly preſſed, was obliged to have recourſe to his uſual method of bribing the Mauritanian miniſters, in order to put that prince in motion. He alſo promiſed him a third part of his kingdom, provided they could either drive the Romans out of Africa, or get all the Numidian dominions confirmed to him by treaty.

So conſiderable a ceſſion could not fail of engaging Bocchus to ſupport Jugurtha with his whole power. The two African monarchs therefore, having joined their forces, ſurpriſed Marius near Cirta as he was going into winter quarters. The Roman general was ſo puſhed on this occaſion, that the barbarians thought themſelves certain of victory, and doubted not but they ſhould be able to extinguiſh the Roman name in Numidia. But their incaution and too great ſecurity enabled Marius to give them a total defeat; which was followed four days after by ſo complete an overthrow, that their numerous army, conſiſting of 90,000 men, by the acceſſion of a powerful corps of Moors, commanded by Bocchus's ſon Volux, was entirely ruined. Sylla, Marius's lieutenant, moſt eminently diſtinguiſhed himſelf in the laſt action, which laid the foundation of his future greatneſs. Bocchus, now looking upon Jugurtha's condition as deſperate, and not being willing to run the riſk of loſing his dominions, ſhowed a diſpoſition to clap up a peace with Rome. However, the republic gave him to underſtand, that he muſt not expect to be ranked amongſt its friends, till he had delivered up into the conſul's hands Jugurtha, the inveterate enemy of the Roman name. The Mauritanian monarch, having entertained a high idea of an alliance with that ſtate, reſolved to ſatisfy it in this particular; and was confirmed in his reſolution by one Dabar, a Numidian prince, the ſon of Maſſugrada, and deſcended by his mother's ſide from Maſiniſſa. Being cloſely attached to the Romans, and extremely agreeable to Bocchus on account of his noble diſpoſition, he defeated all the intrigues of Aſpar, Jugurtha's miniſter. Upon Sylla's arrival at the Mauritanian court, the affair there ſeemed to be entirely ſettled. However, Bocchus, who was for ever projecting new deſigns,

18 Jugurtha entirely defeated.

deſigns, and, like the reſt of his countrymen, in the higheſt degree perfidious, debated within himſelf, whether he ſhould ſacrifice Sylla or Jugurtha, who were both then in his power. He was a long time fluctuating with uncertainty, and combated by a contrariety of ſentiments. The ſudden changes which diſplayed themſelves in his countenance, his air, and his whole perſon, evidently ſhowed how ſtrongly his mind was agitated. But at laſt he returned to his firſt deſign, to which the bias of his mind ſeemed naturally to lead him. He therefore delivered up Jugurtha into the hands of Sylla, to be conducted to Marius; who, by that ſucceſsful event, happily terminated this dangerous war. The kingdom of Numidia was now reduced to a new form: Bocchus, for his important ſervices, had the country of the Maſſæſyli, contiguous to Mauritania, aſſigned him: which, from this time, took the name of *New Mauritania.* Numidia Propria, or the country of the Maſſyli, was divided into three parts; one of which was given to Hiempſal, another to Mandreſtal, both deſcendants of Maſiniſſa; and the third the Romans annexed to Africa Propria, or the Roman province adjacent to it. What became of Jugurtha after he had graced Marius's triumph, at which ceremony he was led in chains, together with his two ſons, through the ſtreets of Rome, we have already laid before our readers. See JUGURTHA.

20
Tranſactions after the death of Jugurtha.

Jugurtha's two ſons ſurvived him, but ſpent their lives in captivity at Venuſia. However, one of them, named *Oxyntas*, was, for a ſhort time, releaſed from his confinement by Aponius, who beſieged Acerræ in the war between the Romans and the Italian allies. That general brought this prince to his army, where he treated him as king, in order to draw the Numidian forces off from the Roman ſervice. Accordingly thoſe Numidians no ſooner heard that the ſon of their old king was fighting for the allies, than they began to deſert by companies; which obliged Julius Cæſar the conſul to part with all his Numidian cavalry, and ſend them back into Africa. Some few years after this event, Pompey defeated Cneius Domitius Ahenobarbus, and Hiarbas one of the kings of Numidia, killing 17,000 of their men upon the ſpot. Not ſatisfied with this victory, that general purſued the fugitives to their camp, which he ſoon forced, put Domitius to the ſword, and took Hiarbas priſoner. He then reduced that part of Numidia which belonged to Hiarbas, who ſeems to have ſucceeded Mandreſtal abovementioned; and gave it to Hiempſal, a neighbouring Numidian prince, deſcended from Maſſiniſſa, who had always oppoſed the Marian faction.

21
Cæſar inſults Juba.

Suetonius informs us, that a diſpute happened between Hiempſal and one Maſintha, a noble Numidian, whom, it is probable, he had in ſome reſpect injured when Julius Cæſar firſt began to make a figure in the world. The ſame author adds, that Cæſar warmly eſpouſed the cauſe of Maſintha, and even groſsly inſulted Juba, Hiempſal's ſon, when he attempted to vindicate his father's conduct on this occaſion. He pulled him by the beard, than which a more unpardonable affront could not be offered to an African. In ſhort, he ſcreened Maſintha from the inſults and violence of his enemies; from whence a reaſon may be aſſigned for Juba's adhering ſo cloſely afterwards to the Pompeian faction.

22
Juba defeats one of Cæſar's lieutenants.

In conſequence of the indignity Cæſar had offered Juba, and the diſpoſition it had occaſioned, that prince did Cæſar great damage in the civil wars betwixt him and Pompey. By a ſtratagem he drew Curio, one of his lieutenants, into a general action, which it was his intereſt at that time to have avoided. He cauſed it to be given out all over Africa Propria and Numidia, that he was retired into ſome remote country at a great diſtance from the Roman territories. This coming to Curio's ears, who was then beſieging Utica, it hindered him from taking the neceſſary precautions againſt a ſurpriſe. Soon after, the Roman general receiving intelligence that a ſmall body of Numidians was approaching his camp, he put himſelf at the head of his forces in order to attack them, and, for fear they ſhould eſcape, began his march in the night, looking upon himſelf as ſure of victory. Some of their advanced poſts he ſurpriſed aſleep, and cut them to pieces; which ſtill farther animated him. In ſhort, about day break he came up with the Numidians, whom he attacked with great bravery, though his men were then faſting, and vaſtly fatigued by their forced and precipitate march. In the mean time, Juba, who, immediately after the propagation of the rumour above mentioned, had taken care to march privately, with the main body of the Numidian army, to ſupport the detachment ſent before to decoy Curio, advanced to the relief of his men. The Romans had met with a great reſiſtance before he appeared; ſo that he eaſily broke them, killed Curio, with a great part of his troops, upon the ſpot, purſued the reſt to their camp, which he plundered, and took many of them priſoners. Moſt of the fugitives, who endeavoured to make their eſcape on board the ſhips in the port of Utica, were either ſlain by the purſuers, or drowned. The remainder fell into the hands of Varus, who would have ſaved them; but Juba, who arrogated to himſelf the honour of this victory, ordered moſt of them to be put to the ſword.

23
Juba overthrown by Cæſar.

This victory infuſed new life and vigour into the Pompeian faction, who thereupon conferred great honours upon Juba, and gave him the title of *king of all Numidia.* But Cæſar and his adherents declared him an enemy to the ſtate of Rome, adjudging to Bocchus and Bogud, two African princes entirely in their intereſt, the ſovereignty of his dominions. Juba afterwards, uniting his forces with thoſe of Scipio, reduced Cæſar to great extremities, and would in all probability have totally ruined him, had he not been relieved by Publius Sittius. That general, having formed a conſiderable corps, conſiſting of Roman exiles, and Mauritanian troops ſent him by Bocchus, according to Dio, or, as Cæſar will have it, Bogud, made an irruption into Gætulia and Numidia, whilſt Juba was employed in Africa Propria. As he ravaged theſe countries in a dreadful manner, Juba immediately returned with the beſt part of his army, to preſerve them from utter deſtruction. However, Cæſar knowing his horſe to be afraid of the enemy's elephants, did not think proper to attack Scipio in the abſence of the Numidian, till his own elephants, and a freſh reinforcement of troops, hourly expected, arrived from

Italy. With this acceſſion of ſtrength, he imagined himſelf able to give a good account, both of the Roman forces with which he was to cope, and the barbarians. In the mean time Scipio deſpatched reiterated expreſſes to Juba to haſten to his aſſiſtance; but could not prevail upon him to move out of Numidia, till he had promiſed him the poſſeſſion of all the Roman dominions in Africa, if they could from thence expel Cæſar. This immediately put him in motion; ſo that, having ſent a large detachment to make head againſt Sittius, he marched with the reſt of his troops to aſſiſt Scipio. However, Cæſar at laſt overthrew Scipio, Juba, and Labienus, near the town of Thapſus, and forced all their camps. As Scipio was the firſt ſurpriſed and defeated, Juba fled into Numidia without waiting for Cæſar's approach; but the body of the Numidians detached againſt Sittius, having been broken and diſperſed by that general, none of his ſubjects there would receive him. Abandoned therefore to deſpair, he ſought death in a ſingle combat with Petreius, and having killed him, cauſed himſelf to be diſpatched by one of his ſlaves.

24 Numidia reduced to the form of a province.

After this deciſive action, and the reduction of Africa Propria, Cæſar made himſelf maſter of Numidia, which he reduced to a Roman province, appointing Criſpus Salluſtius to govern it in quality of proconſul, with private inſtructions to pillage and plunder the inhabitants, and, by that means, put it out of their power ever to ſhake off the Roman yoke. However, Bocchus and Bogud ſtill preſerved a ſort of ſovereignty in the country of the Maſſæſyli and Mauritania, ſince the former of thoſe princes, having deſerted Cæſar, ſent an army into Spain to aſſiſt the Pompeians; and the latter, with his forces, determined victory to declare for Cæſar at the ever memorable battle of Munda. Bogud, afterwards ſiding with Antony againſt Octavius, ſent a body of forces to aſſiſt him in Spain; at which time the Tingitanians revolting from him, Bocchus, with an army compoſed of Romans in the intereſt of Octavius, who paſſed over from Spain into Africa, and his own ſubjects, poſſeſſed himſelf of Mauritania Tingitana. Bogud fled to Antony; and Octavius, after the concluſion of the war, honoured the inhabitants of Tingi with all the privileges of Roman citizens. He likewiſe confirmed Bocchus king of Mauritania Cæſarienſis, or the country of the Maſſæſyli, in the poſſeſſion of Tingitania, which he had conquered, as a reward for his important ſervices. In this he imitated the example of his great predeceſſor Julius Cæſar, who divided ſome of the fruitful plains of Numidia among the ſoldiers of P. Sittius, who had conquered great part of that country, and appointed Sittius himſelf ſovereign of that diſtrict. Sittius, as has been intimated above, having taken Cirta, killed Sabura, Juba's general, entirely diſperſed his forces, and either cut off or taken priſoners moſt of the Pompeian fugitives that eſcaped from the battle of Thapſus, highly deſerved to be diſtinguiſhed in ſo eminent a manner. After Bocchus's death, Mauritania and the Maſſæſylian Numidia were in all reſpects conſidered Roman provinces.

NUMISMATOGRAPHIA, a term uſed for the deſcription and knowledge of ancient coins and medals, whether of gold, ſilver, or braſs. See COINS and MEDALS.

NUMITOR, the ſon of Procas king of Alba, and the brother of Amulius. Procas before his death made him and Amulius joint heirs to the crown, on condition of their reigning annually by turns: but Amulius, on getting poſſeſſion of the throne, excluded Numitor, whoſe ſon Lauſus he ordered to be put to death, and obliged Rhea Sylvia, Numitor's only daughter, to become a veſtal. This princeſs becoming pregnant, declared that ſhe was with child by the god Mars; and afterwards brought forth Remus and Romulus, who at length killed Amulius, and reſtored Numitor to the throne [illegible] C. See REMUS and ROMULUS.

[illegible] a piece of money otherwiſe called *ſeſte*

NUN, the ſon of Eliſhamah, and father of Joſhua, of the tribe of Ephraim. The Greeks gave him the name of *Nane* inſtead of Nun. This man is known in ſacred hiſtory only by being the father of Joſhua.

NUN, a woman, in ſeveral Chriſtian countries, who devotes herſelf, in a cloiſter or nunnery, to a religious life. See the article MONK.

There were women, in the ancient Chriſtian church, who made public profeſſion of virginity, before the monaſtic life was known in the world, as appears from the writings of Cyprian and Tertulian. Theſe, for diſtinction's ſake, are ſometimes called *eccleſiaſtical virgins*, and were commonly enrolled in the canon or matricula of the church. They differed from the monaſtic virgins chiefly in this, that they lived privately in their fathers houſes, whereas the others lived in communities: but their profeſſion of virginity was not ſo ſtrict as to make it criminal for them to marry afterwards, if they thought fit. As to the conſecration of virgins, it had ſome things peculiar in it: it was uſually performed publicly in the church by the biſhop. The virgin made a public profeſſion of her reſolution, and then the biſhop put upon her the accuſtomed habit of ſacred virgins. One part of this habit was a veil, called the *ſacrum velamen*; another was a kind of mitre or coronet worn upon the head. At preſent, when a woman is to be made a nun, the habit, veil, and ring of the candidate are carried to the altar; and ſhe herſelf, accompanied by her neareſt relations, is conducted to the biſhop, who, after maſs and an anthem, (the ſubject of which is, "that ſhe ought to have her lamp lighted, becauſe the bridegroom is coming to meet her)," pronounces the benediction: then ſhe riſes up, and the biſhop conſecrates the new habit, ſprinkling it with holy water. When the candidate has put on her religious habit, ſhe preſents herſelf before the biſhop, and ſings, on her knees, *Ancilla Chriſti ſum*, &c.; then ſhe receives the veil, and afterwards the ring, by which ſhe is married to Chriſt; and laſtly, the crown of virginity. When ſhe is crowned, an anathema is denounced againſt all who ſhall attempt to make her break her vows. In ſome few inſtances, perhaps, it may have happened that nunneries, monaſteries, &c. may have been uſeful as well to morality and religion as to literature: in the groſs, however, they have been highly prejudicial; and however well they might be ſuppoſed to do when viewed in theory, in fact they are unnatural and impious. It was ſurely far from the intention of Providence to ſeclude youth and beauty in a cloiſtered ruin, or to deny them the innocent enjoyment [illegible] years and ſex.

NUNCIO, or NUNTIO, an ambaſſador from the pope to ſome Catholic prince or ſtate, or a perſon who attends on the pope's behalf at a congreſs, or an aſſembly of ſeveral ambaſſadors.

NUNCUPATIVE, in the ſchools, ſomething that is only nominal, or has no exiſtence but in name.

Nuncupative Will or *Teſtament*, a will made verbally, and not put in writing. See the articles WILL and TESTAMENT.

NUNDINA, a goddeſs among the ancient heathens, ſuppoſed to have the care of the purification of infants. And becauſe male infants were purified nine days after their birth, her name is derived from *nonus*, or the ninth, though female infants were purified the eighth day; which purification was called *luſtration* by the Romans.

NUNDINAL, *Nundinalis*, a name which the Romans gave to the eight firſt letters of the alphabet uſed in their kalendar.

This ſeries of letters, A, B, C, D, E, F, G, H, is placed and repeated ſucceſſively from the firſt to the laſt day of the year: one of theſe always expreſſed the market days, or the aſſemblies called *nundinæ, quaſi novendinæ*, becauſe they returned every nine days. The country people, after working eight days ſucceſſively, came to town the ninth, to ſell their ſeveral commodities, and to inform themſelves of what related to religion and government. Thus the nundinal day being under A on the firſt, ninth, ſeventeenth, and twenty fifth days of January, &c. the letter D will be the nundinal letter of the year following. Theſe nundinals bear a very great reſemblance to the dominical letters, which return every eight days, as the nundinal did every nine.

NUNDOCOMAR, a Rajah in Bengal, and head of the Bramins, who, in 1775, was condemned to an ignominious death by Engliſh laws newly introduced in an Engliſh court of juſtice newly eſtabliſhed, for a forgery charged to have been committed by him many years before. That he was guilty of the deed cannot be queſtioned; but there was ſurely ſomething hard in condemning a man by an *ex poſt facto* law. He bore his fate with the utmoſt fortitude, in the full confidence that his ſoul would ſoon be reunited to the univerſal ſpirit whence it had ſprung. See METAPHYSICS, Part III. Ch. IV. *Of the Immortality of the Soul.*

Monte Nuovo, in the environs of Naples, blocks up the valley of Averno. "This mountain (Mr Swinburne tells us) aroſe in the year 1538, for after repeated quakings, the earth burſt aſunder, and made way for a deluge of hot aſhes and flames, which riſing extremely high, and darkening the atmoſphere, fell down again and formed a circular mound four miles in circumference, and 1000 feet high, with a large cup in the middle. The wind riſing afterwards, wafted the lighter particles over the country, blaſted vegetation, and killed the animals who grazed. The conſequence was, that the place was deſerted, till Don Pedro de Toledo, viceroy of Naples, encouraged the inhabitants by example and otherwiſe to return.

"Part of Monte Nuovo is cultivated, but the larger portion of its declivity is wildly overgrown with prickly broom, and rank weeds that emit a very fetid ſulphureous ſmell. The crater is ſhallow, its inſide clad with ſhrubs, and the little area at the bottom planted with fig and mulberry trees; a moſt ſtriking ſpecimen of the amazing viciſſitudes that take place in this extraordinary country. I ſaw no traces of lava or melted matter, and few ſtones within.

"Near the foot of this mountain the ſubterraneous fires act with ſuch immediate power, that even the ſand at the bottom of the ſea is heated to an intolerable degree."

NUPTIAL RITES, the ceremonies attending the ſolemnization of marriage, which are different in different ages and countries. We cannot omit here a cuſtom which was practiſed by the Romans on theſe occaſions; which was this: Immediately after the chief ceremonies were over, the new married man threw *nuts* about the room for the boys to ſcramble for. Various reaſons have been aſſigned for it; but that which moſt generally prevails, and ſeems to be the moſt juſt, is, that by this act the bridegroom ſignified his reſolution to abandon trifles, and commence a ſerious courſe of life; whence *nucibus relictis* in this ſenſe became a proverb. They might alſo be an emblem of fertility.

The ancient Greeks had a perſon to conduct the bride from her own to the bridegroom's houſe, and hence he was called by the Greeks *Nymphagogos*, which term was afterwards uſed both by the Romans and the Jews.

NUREMBERG, an imperial city of Germany, capital of a territory of the ſame name, ſituated in E. Long. 11°, N. Lat. 47. 30. It ſtands on the Regnitz, over which it has ſeveral bridges, both of wood and ſtone, at the bottom of a hill, 60 miles from Augſburg, 87 from Munich, 46 from Wurtzburg, and 50 from Ratiſbon; and is thought by ſome to be the Segodunum, and by others the Caſtrum Noricum of the ancients.

The city has derived its name from the hill, upon which ſtands the caſtle, called, in Latin, Caſtrum Noricum, round which the city was begun to be built, and where the emperors formerly lodged, and here they lodge ſtill, when they paſs by that city. They there preſerve, as precious relicks, the crown, ſceptre, clothes, buſkins, and other ornaments of Charlemagne (A), which ſerved alſo the emperor Leopold, when he went thither after his election, to receive the homage of the city. The ſmall river Regnitz, which runs through it, and thoſe of Rednitz and Schwartzack, which paſs by its walls, furniſh the inhabitants, beſides other advantages, with the means of making all ſorts of ſtuffs, dyes, and other manufactures (B).

(A) Theſe ornaments are, a mitred crown, enriched with rubies, emeralds, and pearls; the dalmatic of Charlemagne, richly embroidered, the imperial mantle powdered, with embroidered eagles, and its border thick ſet with large emeralds, ſapphires, and topazes; the buſkins covered with plates of gold, the gloves embroidered, the apple, the golden ſceptre, and ſword. The ancient cuſtom of the empire is, that the emperor is bound to aſſemble in this city the firſt diet that he holds after his election and coronation.

(B) There is in Nuremberg, and in the neighbouring villages depending upon it, an infinite number of workmen and toys, which are carried and ſold even in the Indies.

It is a large and well built town, but not very populous. Its fortifications are a double wall, flanked with towers mounting cannon, and a deep ditch. The magiſtrates, and moſt of the inhabitants, are Lutherans. There are a great many churches and chapels in it. In that of St Sebald is a braſs monument of the ſaint; and a picture, repreſenting the creation of the world, by the celebrated Albert Durer, who was a native of the town; but the fineſt church in the town is that of St Giles. In that of the Holy Ghoſt are kept moſt of the jewels of the empire, together with the pretended ſpear with which our Saviour's ſide was pierced, a thorn of his crown, and a piece of the manger wherein he was laid. Here are alſo a great many hoſpitals, one in particular for foundlings, and another for pilgrims; with a gymnaſium, an anatomical theatre, a granary, a fine public library, the old imperial fortreſs or caſtle, ſome remains of the old citadel of the burgraves of Nuremberg, ſeveral Latin ſchools, an academy of painting, a well furniſhed arſenal, a Teutonic houſe in which the Roman Catholic ſervice is tolerated, and a mint. Mr Keyſler ſays, there are upwards of 500 ſtreets in it, about 140 fountains, 16 churches, 44 religious houſes, 12 bridges, 10 market places, and 25,000 inhabitants; and that its territories, beſides the capital and four other towns, contain above 500 villages, and about 160 mills on the Regnitz. The trade of this city, though upon the decline, is ſtill very great, many of its manufactures being ſtill exported to all parts of the world; among which may be reckoned a great variety of curious toys in ivory, wood, and metal, already mentioned. The city has alſo diſtinguiſhed itſelf in the arts of painting and engraving. When the emperor Henry VI. aſſiſted at a tournament in Nuremberg, he raiſed 38 burghers to the degree of nobility, the deſcendants of whom are called *patricians*, and have the government of the city entirely in their hands; the whole council, except eight maſters of companies, who are ſummoned only on extraordinary occaſions, conſiſting of them. Among the fine braſs cannon in the arſenal, is one that is charged at the breech, and may be fired eight times in a minute; and two that carry balls of eighty pounds. The city keeps, in conſtant pay, ſeven companies, conſiſting each, in time of peace, of 100 men, but, in time of war, of 185; two troops of cuiraſſiers, each conſiſting of 85 men; and two companies of invalids. There are alſo 24 companies of burghers, well armed and diſciplined. On the new bridge, which is ſaid to have coſt 100,000 guilders, are two pyramids, on the top of one of which is a dove with an olive branch in her bill, and on the other an imperial black eagle. Muſic alſo flouriſhes greatly in Nuremberg; and thoſe who delight in mechanic arts and manufactures cannot anywhere better gratify their curioſity. As an imperial city, it has a ſeat and voice at the diets of the empire and circle, paying to the chamber of Wetzlar 812 rixdollars each term. The territory belonging to the city is pretty large, containing, beſides two conſiderable foreſts of pine, called the *Sebald* and *Laurence foreſts*, ſeveral towns and villages.

We have mentioned already that certain families called patricians, to the excluſion of the reſt, poſſeſs the offices of the ſenate. They are compoſed of 42 perſons (c), over which two caſtellans, or perpetual ſeneſchals, preſide, the firſt of whom has his reſidence in the caſtle. Theſe caſtellans aſſemble ſometimes in the caſtle, with five or ſix of the chief members, to hold a ſecret council (d). And, as this city glories in being one of the firſt which embraced Lutheraniſm, it preſerves the privilege of that in civil matters, not admitting any Catholics to the magiſtracy or freedom of the town; the Catholics there having the liberty only of remaining under the protection of the reſt, and performing their religious worſhip in a commandery of Malta, and this but at certain hours, not to diſturb the Lutherans, who likewiſe aſſemble there, although in poſſeſſion of all the other churches.

This city is particularly noted for its antiquity, grandeur, fortifications, its triple walls of hewn ſtone, its large and deep moat, its fine houſes, large churches, its wide ſtreets, always clean, and for its curious and large library, and its magazine ſtored with every thing proper for its defence.

NURSERY, in gardening, is a piece of land ſet apart for raiſing and propagating all ſorts of trees and plants to ſupply the garden and other plantations.

NURSING OF CHILDREN. See LACTATIO.

The following obſervations are ſaid to be the reſult of long experience †. A child, when it comes into the world, is almoſt a round ball; it is the nurſe's part to aſſiſt nature, in bringing it to a proper ſhape. The child ſhould be laid (the firſt month) upon a thin mattreſs, rather longer than itſelf, which the nurſe will keep upon her lap, that the child may always lie ſtraight, and only ſit up as the nurſe ſlants the mattreſs. To ſet a child quite upright before the end of the firſt month, hurts the eyes, by making the white part of the eye appear below the upper eyelid. Afterwards the nurſe will begin to ſet it up and dance it by degrees. The child muſt be kept as dry as poſſible.

† An. Reg. Vol. VI. p. 130.

The clothing ſhould be very light, and not much longer than the child, that the legs may be got at with eaſe, in order to have them often rubbed in the day

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workmen, very ingenious in making ſeveral kinds of toys of wood, which are carried through all the fairs of Germany, and from thence through all Europe. Theſe toys are called Nurembergs; and they have ſo great a ſale, that it even exceeds deſcription. This employment affords a livelihood to the greateſt part of the inhabitants of the city; and they make a very conſiderable profit from this traffic.

(c) Of theſe 42 members, there are only 34 choſen from the patrician families; the other eight are taken from among the burghers, and make in a manner a ſmall ſeparate body.

(d) This ſecret council is compoſed of ſeven principal chiefs of the republic, and for that reaſon is called *ſeptemvirate*. It determines the moſt important affairs; and is the depoſitory of the precious ſtones of the empire, of the imperial crown, the enſigns, ſeals, and keys of the city.

Nurſing.

day with a warm hand or flannel, and in particular the inſide of them.

Rubbing a child all over takes off ſcurf, and makes the blood circulate. The one breaſt ſhould be rubbed with the hands one way, and the other the other way, night and morning at leaſt.

The ankle bones and inſide of the knees ſhould be rubbed twice a day; this will ſtrengthen thoſe parts, and make the child ſtretch its knees and keep them flat, which is the foundation of an erect and graceful perſon.

A nurſe ought to keep a child as little in her arms as poſſible, leſt the legs ſhould be cramped, and the toes turned inwards. Let her always keep the child's legs looſe. The oftener the poſture is changed, the better.

Toſſing a child about, and exerciſing it in the open air in fine weather, is of the greateſt ſervice. In cities, children are not to be kept in hot rooms, but to have as much air as poſſible.

Want of exerciſe is the cauſe of large heads, weak and knotted joints, a contracted breaſt, w [illegible] ſions coughs and ſtuffed lungs, an ill [illegible] and waddling gait, beſides a numerous train [illegible] ills.

The child's fleſh is to be kept perfectly clean, by conſtantly waſhing its limbs and likewiſe its neck and ears; beginning with warm water, till by degrees it will not only bear, but like to be waſhed with cold.

Riſing early in the morning is good for all children, provided they awake of themſelves, which they generally do: but they are never to be waked out of their ſleep, and as ſoon as poſſible to be brought to regular ſleeps in the day.

When laid in bed or cradle, their legs are always to be laid ſtraight.

Children, till they are two or three years old, muſt never be ſuffered to walk long enough at a time to be weary.

Girls might be trained to the proper management of children, if a premium were given in free ſchools, workhouſes, &c. to thoſe that brought up the fineſt child to one year old.

If the mother cannot ſuckle the child, get a wholeſome cheerful woman, with young milk, who has been uſed to tend young children. After the firſt ſix months, ſmall broths, and innocent foods of any kind, may do as well as living wholly upon milk.

A principal thing to be always attended to is, to give young children conſtant exerciſe, and to keep them in a proper poſture.

With regard to the child's dreſs in the day, let it be a ſhirt; a petticoat of fine flannel, two or three inches longer than the child's feet, with a dimity top (commonly called a *bodice coat*), to tie behind; over that a ſurcingle made of fine buckram, two inches broad, covered over with ſatin or fine ticken, with a ribbon faſtened to it to tie it on, which anſwers every purpoſe of ſtays, and has none of their inconveniences. Over this put a robe, or a ſlip and frock, or whatever you like beſt; provided it is faſtened behind, and not much longer than the child's feet, that their motions may be ſtrictly obſerved.

Two caps are to be put on the head, till the child has got moſt of its teeth.

Nuſance ‖ Nutcracker.

The child's dreſs for the night may be a ſhirt, a blanket to tie on, and a thin gown to tie over the blanket.

NUSANCE, or Nuisance, in law, a thing done to the annoyance of another.

Nuiſances are either public or private.—A public nuiſance is an offence againſt the public in general, either by doing what tends to the annoyance of all the king's ſubjects, or by neglecting to do what the common good requires: in which caſe, all annoyances and injuries to ſtreets, highways, bridges, and large rivers, as alſo diſorderly alehouſes, bawdy-houſes, gaming houſes, ſtages for rope-dancers, &c. are held to be common nuiſances.—A private nuiſance is, when only one perſon or family is annoyed by the doing of any thing; as where a perſon ſtops up the light of another's houſe, or builds in ſuch a manner that the rain falls from his houſe upon his neighbour's.

NUT, among botaniſts, denotes a pericarpium of an extraordinary hardneſs, encloſing a kernel or ſeed.

NUTATION, in aſtronomy, a kind of tremulous motion of the axis of the earth, whereby, in each annual revolution, it is twice inclined to the ecliptic, and as often returns to its former poſition.

NUTCRACKER. See Corvus, N° 8.

Plate cccxlvii.

"This bird (ſays Buffon) is diſtinguiſhed from the jays and magpies by the ſhape of its bill, which is ſtraighter, blunter, and compoſed of two unequal pieces. Its inſtinct is alſo different; for it prefers the reſidence of high mountains, and its diſpoſition is not ſo much tinctured with cunning and ſuſpicion."

They live upon hazel nuts, acorns, wild berries, the kernels of pine tops, and even on inſects.

"Beſides the brilliancy of the plumage, the nutcracker is remarkable for the triangular white ſpots which are ſpread over its whole body, except the head. Theſe ſpots are ſmaller on the upper part, and broader on the breaſt; their effect is the greater, as they are contraſted with the brown ground.

"Theſe birds are moſt attached, as I have obſerved above, to mountainous ſituations. They are common in Auvergne, Savoy, Lorraine, Franche-Compté, Switzerland, the Bergamaſque, in Auſtria, in the mountains which are covered with foreſts of pines. They alſo occur in Sweden, though only in the ſouthern parts of that country. The people in Germany call them Turkey birds, Italian birds, African birds, which language means no more than that they are foreign.

"Though the nutcrackers are not birds of paſſage, they fly ſometimes from the mountains to the plains. Friſch ſays, that flocks of them are often obſerved to accompany other birds into different parts of Germany, eſpecially where there are pine foreſts. But in 1754, great flights of them entered France, particularly Burgundy, where there are few pines; they were ſo fatigued on their arrival, that they ſuffered themſelves to be caught by the hand.

"We cannot find in writers of natural hiſtory any details with regard to their laying, their incubation, the training of their young, the duration of their life, &

&c. for they haunt inacceſſible ſpots, where they enjoy undiſturbed ſafety and felicity."

NUTHATCH, in ornithology. See SITTA, its generic name. In this place we ſhall only extract from Buffon an account of two ſpecies of foreign birds related to the nuthatch.

1. *The great hook-billed nuthatch.*—"It is the largeſt of the known nuthatches: its bill, though pretty ſtraight, is inflated at the middle, and a little hooked at the end; the noſtrils are round; the quills of the tail and of the wings edged with orange on a brown ground; the throat white; the head and back gray; the under ſide of the body whitiſh. Such are the principal properties of the bird. It was obſerved by Sloane in Jamaica.

"Its total length is about ſeven inches and a half; the bill is eight lines and one third; the upper mandible a little protuberant near the middle; the mid toe, eight lines and one third; the alar extent, eleven inches and a quarter; the tail about twenty-three lines."

Plate CCCXLVII.

2. *The ſpotted* or *Surinam nuthatch.*—This is another American nuthatch, with a hooked bill; but differs from the preceding in ſize, plumage, and climate: it inhabits Dutch Guiana.

"The upper ſide of the head and of the body is of a dull aſh colour; the ſuperior coverts of the wings of the ſame colour, but terminated with white; the throat white; the breaſt and all the under ſide of the body cinereous, and more dilute than the upper ſide, with white ſtreaks ſcattered on the breaſt and ſides, which forms a ſort of ſpeckling; the bill and legs brown.

"Total length, about ſix inches; the bill, an inch; the *tarſus*, ſeven lines and a half; the mid toe, eight or nine lines, and longer than the hind toe, whoſe nail is the ſtrongeſt; the tail, about eighteen lines, conſiſting of twelve nearly equal quills, and exceeds the wings thirteen or fourteen lines."

Plates CCCXXXIV. and CCCXXXV.

NUTMEG. See MYRISTICA, its generic name. The tree which produces this fruit, was formerly thought to grow only in the Banda iſlands. It is now paſt a doubt, however, that it grows in the Iſle of France and in all or moſt of the iſles of the South ſeas. It ſeems a little remarkable that this trade, which is certainly a lucrative one, ſhould have been ſo long monopolized by the Dutch. Their cunning and deſire to retain it in their own hands ſeems to account for the idea that ſo generally prevailed formerly that it grew only in their ſettlements. It was reported as early as the year 1751, upon what appeared at that time to be good grounds, that it was likely to be produced in the Weſt Indies. An Engliſh ſailor ſaid he had ſeen ſome trees in Jamaica, and the governor on inquiry found it ſo, and that they agreed exactly with the deſcription given of thoſe in the Spice Iſlands in the Eaſt Indies. This account, which was given in the Gentleman's Magazine for January 1751, we have never ſeen confirmed; and therefore we ſuppoſe that the expectations formed were either fruſtrated or premature: however, it is certain, as we have obſerved under the generic name, that a wild ſpecies of it grows at Tobego. To avoid repetition, or the appearance of prolixity, we muſt refer thoſe who wiſh for farther information reſpecting the trade in this article to M. P. Sonnerat's account of a voyage to the Spice Iſlands and New Guinea, which was printed at Paris in 1775, and tranſlated into Engliſh and printed at Bury St Edmund's in 1781, &c. and to Bougainville's voyage, and Dr Hawkeſworth's compilation of Engliſh voyages.

It will not, however, we truſt, be deemed improper, nor beſide our purpoſe, if we lay before our readers the following account of the dangerous conſequences of uſing this article to exceſs. It was given by Dr Jacob [illegible], publiſhed in the Gentleman's Magazine for [illegible].

"A gentleman of Lower Sileſia, about thirty-ſix years old, of a good conſtitution, and who enjoyed a good [illegible] of health, having felt, during ſome days, ſome [illegible], took it in his head, by way of remedy, to eat four nutmegs, which weighed all together two ounces, and he drank, in eating them, ſome glaſſes of [illegible], which he had no ſooner done, but he was ſeized with a great heat, a violent pain in the head, a vertigo, [illegible], and was inſtantly deprived of the uſe of ſight, ſpeech, and of all his ſenſes. He was put to bed, where he remained two days and two nights; his body was oppreſſed with laſſitude, always drowſy, yet without being able to ſleep. The third day he was in that lethargic ſtate, which is called a *coma vigil*, with a weak and intermitting pulſe. Cephalic remedies, cordials, and among others the ſpirit of cephalic vitriol, and the eſſence of caſtoreum, were adminiſtered in good ſpirit of ſal ammoniac. The fourth day he recovered a little, but had abſolutely loſt his memory, ſo as not to remember the leaſt thing he had done in his life. A continued fever then came on, accompanied by an obſtinate watchfulneſs; a palpitation of the heart ſeemed to be the forerunner of other ſymptoms, and he was finally ſtruck with a palſy in all his limbs.

"At the expiration of eight days, he recovered the uſe of reaſon, and ſaid, that during the firſt four days of his illneſs, he ſeemed to himſelf to have conſtantly a thick veil before his eyes, and that a great number of ſparks and flaſhes continually iſſued from it. All the bad ſymptoms of this malady yielded at laſt ſucceſſively to the continued uſe of remedies ſuited to his condition; and in three months time he was perfectly recovered, but he was particularly indebted for his cure to mercurial and ammoniacal remedies.

"According to chemical principles, it might perhaps be ſaid, that the aromatic and oily ſalt contained in nutmeg, of which this patient had taken too large a doſe, had immediately excited ſo great an agitation in the humours, and ſo rapid a motion in the animal ſpirits, as in ſome meaſure to partake of the nature of fire, and that a viſcid and narcotic ſulphur, which reſides likewiſe in the nutmeg, though in a leſs ſenſible manner, being carried at the ſame time into the maſs of blood, by ſuddenly fixing the animal ſpirits, and intercepting their courſe in the nerves, had afterwards cauſed the ſtupor in the limbs, the aphony, and the palſy. But I leave others to explain theſe phenomena; my only view, by communicating this obſervation, being to ſhow that the immoderate uſe of nutmeg may be attended with very great danger."

NUTRITION, in the animal economy, is the repairing the continual loſs which the different parts of the body undergo. The motion of the parts of the body, the friction of theſe parts with each other, and eſpecially the action of the air, would deſtroy the body entirely, if the loſs was not repaired by a proper diet, containing nutritive juices; which being digeſted in the ſtomach, and afterwards converted into chyle, mix with the blood, and are diſtributed through the whole body for its nutrition.

In young perſons, the nutritive juices not only ſerve to repair the parts that are damaged, but alſo to increaſe them, which is called *growth*.

In grown perſons, the cuticle is everywhere conſtantly deſquamating, and again renewing; and in the ſame manner the parts rubbed off, or otherwiſe ſeparated from the fleſhy parts of the body, are then ſupplied with new fleſh; a wound [illegible] ciated perſon grows plump and fat.

Buffon, in order to account for nutrition, ſuppoſes the body of an animal or vegetable to be a kind of mould, in which the matter neceſſary to its nutrition is modelled and aſſimilated to the whole. But (continues he) of what nature is this matter which an animal or vegetable aſſimilates to its own ſubſtance? What power is it that communicates to this matter the activity and motion neceſſary to penetrate this mould? and, if ſuch a force exiſt, would it not be by a ſimilar force that the internal mould itſelf might be reproduced?

As to the firſt queſtion, he ſuppoſes that there exiſts in nature an infinite number of living organical parts, and that all organized bodies conſiſt of ſuch organical parts; that their production coſts nature nothing, ſince their exiſtence is conſtant and invariable; ſo that the matter which the animal or vegetable aſſimilates to its ſubſtance, is an organical matter of the ſame nature with that of the animal or vegetable, which conſequently may augment its volume without changing its form or altering the quality of the ſubſtance in the mould.

As to the ſecond queſtion: There exiſt (ſays he) in nature certain powers, as that of gravity, that have no affinity with the external qualities of the body, but act upon the moſt intimate parts, and penetrate them throughout, and which can never fall under the obſervation of our ſenſes.

And as to the third queſtion, he anſwers, that the internal mould itſelf is reproduced, not only by a ſimilar power, but it is plain that it is the very ſame power that cauſes the unfolding and reproduction thereof: for it is ſufficient (proceeds he), that in an organized body that unfolds itſelf, there be ſome part ſimilar to the whole, in order that this part may one day become itſelf an organized body, altogether like that of which it is actually a part.

NUX MOSCHATA. See MYRISTICA and NUTMEG.

Nux Piſtachia. See PISTACHIA.

Nux Vomica, a flat, compreſſed, round fruit, about the breadth of a ſhilling, brought from the Eaſt Indies. It is found to be a certain poiſon for dogs, cats, &c. and it is not to be doubted that it would alſo prove fatal to mankind. Its ſurface is not much corrugated; and its texture is firm like horn, and of a pale grayiſh-brown colour. It is ſaid to be uſed as a ſpecific againſt the bite of a ſpecies of water ſnake. It is conſiderably bitter and deleterious; but has been uſed in doſes from five to ten grains twice a-day or ſo, in intermittents, particularly obſtinate quartans, and in contagious dyſentery. The *ſtrychnus Ignatii* is a tree of the ſame kind producing gourd-like fruit, the ſeeds of which are improperly called St Ignatius's beans. Theſe, as alſo the woods or roots of ſome ſuch trees, called *lignum colobrinum* or *ſnakewood*, are very narcotic bitters like the nux vomica.

NUYTS (Peter), a native of Holland, and a leading character in that extraordinary tranſaction which happened between the Japaneſe and the Dutch about the year 1628. In 1627 Nuyts arrived in Batavia from Holland, and was in the ſame year appointed ambaſſador to the emperor of Japan by the governor and council of Batavia.

He repaired to that empire in 1628; and being a man of a haughty diſpoſition, and extremely vain, he believed it practicable to paſs upon the natives for an ambaſſador from the king of Holland. Upon his aſſuming this title he was much more honourably received, careſſed, and reſpected, than former miniſters had been. But he was ſoon detected, reprimanded, and reproached in the ſevereſt manner, ſent back to the port, and ordered to return to Batavia with all the circumſtances of diſgrace imaginable; notwithſtanding which, his intereſt was ſo great, that, inſtead of being puniſhed as he deſerved, he was immediately afterwards promoted to the government of the iſland of Formoſa, of which he took poſſeſſion the year following.

He entered upon the adminiſtration of affairs in that iſland with the ſame diſpoſition that he had ſhown while ambaſſador, and with the moſt implacable reſentment againſt the Japaneſe, neither was it long before an opportunity offered, as he thought, of revenging himſelf to the full. Two large Japaneſe ſhips, with upwards of five hundred men on board, came into the port; upon which he took it into his head to diſarm and unrig them, in the ſame manner as the Dutch veſſels are treated at Japan. The Japaneſe did all they could to defend themſelves from this ill uſage; but at laſt, for want of water, they were forced to ſubmit. Governor Nuyts went ſtill further. When they had finiſhed their affairs at Formoſa, and were deſirous of proceeding, according to their inſtructions, to China, he put them off with fair words and fine promiſes till the monſoon was over. They began then to be very impatient, and deſired to have their cannon and ſails reſtored, that they might return home; but the governor had recourſe to new artifices, and, by a ſeries of falſe promiſes, endeavoured to hinder them from making uſe of the ſeaſon proper for that voyage.

The Japaneſe, however, ſoon perceived his deſign; and at length, by a bold attempt, accompliſhed what by fair means and humble entreaty they could not obtain; for, by a daring and well concerted effort, they took him priſoner, and made him and one of the council ſign a treaty for ſecuring their liberty, free departure, and indemnity, which was afterwards ratified by the whole council. Nuyts was firſt confined in Batavia, and afterwards delivered up to the Japaneſe, notwithſtanding the moſt earneſt entreaties on his part to be tried, and even to ſuffer any kind of death where he was, rather than to be ſent to Japan. He was ſent thither, however, in 1634. He was ſubmitted to the mercy or diſcretion of the emperor; and the conſequence was, that, though impriſoned, he was well uſed, and could go anywhere, provided his guards were with him, which was more than he could poſſibly have expected. He now looked for nothing but the continuance of his confinement for life. On a particular occaſion, however, i. e. at the funeral of the emperor's father, at the requeſt of the Dutch he was ſet free, and returned again to Batavia, to the ſurpriſe of that people, who, however, adopted ever after a very different conduct with reſpect to the Japaneſe.

NUZZER, or NUZZERANAH; a preſent or offering from an inferior to a ſuperior. In Hindoſtan no man ever approaches his ſuperior for the firſt time on buſineſs without an offering of at leaſt a gold or ſilver rupee in his right hand; which if not taken is a mark of diſfavour. Nuzzeranah is alſo uſed for the ſum paid to the government as an acknowledgment for a grant of lands or any public office.

NYCHTHEMERON, among the ancients, ſignified the whole natural day, or day and night, conſiſting of 24 hours, or 24 equal parts. This way of conſidering the day was particularly adopted by the Jews, and ſeems to owe its origin to that expreſſion of Moſes, in the firſt chapter of Geneſis, "the evening and the morning were the firſt day."—Before the Jews had introduced the Greek language into their diſcourſe, they uſed to ſignify this ſpace of time by the ſimple expreſſion of a night and a day.

It is proper here to obſerve, that all the eaſtern countries reckoned any part of a day of 24 hours for a whole day; and ſay a thing that was done on the third or ſeventh day, &c. from that laſt mentioned, was done after three or ſeven days. And the Hebrews, having no word which exactly anſwers to the Greek *Νυχημερον*, ſignifying "a natural day of 24 hours," uſe *night and day*, or *day and night*, for it. So that to ſay a thing happened after three days and three nights, was, with them, the ſame as to ſay it happened after three days, or on the third day. This, being remembered, will explain what is meant by "the Son of Man's being three days and three nights in the heart of the earth."

NYCTALOPIA. See MEDICINE, N° 361.

NYCTANTHES, ARABIAN JASMINE: A genus of the monogynia order, belonging to the diandria claſs of plants; and in the natural method ranking with the 44th order, *Sapiariæ*. The corolla and calyx are octofid; the perianthium dicoccous. There are five ſpecies: the moſt remarkable of which are, 1. The arbor triſtis, or ſorrowful tree. This tree, or ſhrub, the *pariatacu* of the Bramins, grows naturally in ſandy places in India, particularly in the iſlands of Ceylon and Java, where it is produced in great abundance, and attains the height of 18 or 20 feet. It riſes with a four-cornered ſtem, bearing leaves that are oval, and taper to a point. They ſtand oppoſite, on ſhort footſtalks; are of a ſhining browniſh green on the upper ſide, a more vivid green on the under, and of a taſte that is aſtringent and ſomewhat bitter. From the middle rib, on the under ſurface of the leaves, proceed on both ſides a number of coſtulæ, or ſmaller ribs, which run nearly to the margin, and mark the ſurface with the impreſſion of their arched furrows. The flowers, which are white and highly odoriferous, having a ſweet delectable ſmell emulating the beſt honey, conſiſt of one petal deeply divided into eight parts, which are narrower towards the ſtalk, and dilated towards the ſummit. They ſtand upon footſtalks, which emerge from the origin of the leaves; are rigid, obliquely raiſed towards the top, grow oppoſite in pairs, and are divided into three ſhort leſſer branches, which each ſupports five flowers placed cloſe together, without partial footſtalks. The fruit is dry, capſular, membranaceous, and compreſſed.

It is generally aſſerted of this plant, that the flowers open in the evening, and fall off the ſucceeding day. Fabricius and Paludanus, however, reſtrict the aſſertion, by affirming, from actual obſervation, that this effect is found to take place only in ſuch flowers as are immediately under the influence of the ſolar rays. Grimmius remarks in his *Laboratorium Ceylonicum*, that the flowers of this tree afford a fragrant water, which is cordial, refreſhing, and frequently employed with ſucceſs in inflammations of the eyes. The tube of the [illegible], when dried, has the ſmell of ſaffron; and, being pounded and mixed with ſanders wood, is uſed by the natives of the Malabar coaſt for imparting a grateful fragrancy to their bodies, which they rub or anoint with the mixture.

2. The ſambac, noted, like the other ſpecies, for the fragrancy of its flowers, is a native likewiſe of India; and is cultivated in our ſtoves, where it generally riſes with a twining ſtem to the height of 18 or 20 feet. The leaves are oppoſite, ſimple, and entire; but in different parts of the plant aſſume different forms: the lower leaves being heart-ſhaped and blunt; the upper, oval and ſharp. The flowers are white, inexpreſſibly fragrant, and generally appear with us in the warm ſummer months. Strong loam is its proper ſoil. There is a variety of this ſpecies with a double flower, which is much larger and more fragrant than the former.

NYCTASTRATEGI, among the ancients, were officers appointed to prevent fires in the night, or to give alarm and call aſſiſtance when a fire broke out. At Rome they had the command of the watch, and were called *nocturni triumviri*, from their office and number.

NYCTICORAX, in ornithology, the night raven; a ſpecies of ARDEA.

NYE (Philip), an Engliſh nonconformiſt, a native of Suſſex, deſcended of a genteel family there, was born about 1596. After a proper foundation at the grammar ſchool, he was ſent to Oxford, and entered a commoner of Brazen Noſe college in 1615, whence he removed in a little time to Magdalen hall, under a puritanical tutor. He took the degrees in arts in 1619 and 1622, about which time he entered into holy orders, and was, ſome time in 1620, curate of St Michael's church in Cornhill, London. Reſolving, however, to reject the conſtitution of the church of England, he became obnoxious to all the cenſures of the epiſcopal court; to avoid which, he went, with others of his perſuaſion, to Holland, in 1633. He continued for the moſt part at Arnheim, in Guelderland, till 1640; when, the power of the parliament beginning to prevail over the king, he returned home, and was ſoon after made miniſter of Kimbolton in Huntingdonſhire, by Edward lord Kimbolton, then earl of Mancheſter. In 1643, he was appointed one of the

Nye.

aſſembly of divines, and became a great champion of the Preſbyterians, and a zealous aſſertor of the ſolemn league and covenant; and, having married the daughter of Stephen Marſhall, was ſent with his father-in-law into Scotland the ſame year, to expedite the taking of their covenant. Accordingly he harangued that people, in ſome ſpeeches on the occaſion; in which he told them, among other things, that they were entered into ſuch a covenant and league as would never be forgotten by them and their poſterity, and both would have occaſion to remember it with joy; that it was ſuch an oath, for matter, perſons, and other circumſtances, that the like had not been in any age, ſufficiently warranted both by human and divine ſtory: for, as God did ſwear for the ſalvation of men and kingdoms, ſo kingdoms muſt now ſwear for the preſervation and ſalvation of kingdoms, to eſtabliſh a Saviour Jeſus Chriſt in England, &c. After his return, both houſes of parliament took the covenant the ſame year; at which time he preached a ſermon in defence of it, ſhowing its warrant from Scriptures, and was rewarded for his good ſervice with the rectory of Acton near London, in the room of Dr Daniel Featly, who was ejected from it. Not long after however, Nye began to diſlike the proceedings of the ſaid aſſembly of divines, and diſſented from them, oppoſing the diſcipline intended to be ſettled by them; and, cloſing with the Independents when they became the reigning faction, he paid his court to the grandees of the army, who often made uſe of his council. In December 1647 he was ſent by them, with Stephen Marſhall, to the king at Cariſbrook caſtle, in the iſle of Wight, in attendance upon the commiſſioners then appointed to carry the four dethroning votes, as they are now called, viz. 1. To acknowledge the war raiſed againſt him to be juſt; 2. To aboliſh epiſcopacy; 3. To ſettle the power of the militia in perſons nominated by the two houſes; 4. To ſacrifice all thoſe that had adhered to him: for which ſervice they were rewarded with no leſs than 500l. a piece. Nye was alſo employed about that time by the ſame maſters to get ſubſcriptions from the apprentices in London, &c. againſt a perſonal treaty with the king, while the citizens of that metropolis were petitioning for one. April the next year he was employed, as well as Marſhall and Joſeph Caryl, by the Independents, to invite the ſecured and ſecluded members to ſit in the houſe again, but without ſucceſs. In 1653 he was appointed one of the triers for the approbation of public preachers; in which office he not only procured his ſon to be clerk, but, with the aſſiſtance of his father-in-law, obtained for himſelf a living of 400l. a year. In 1654, he was joined with Dr Lazarus Seaman, Samuel Clark, Richard Vines, Obadiah Sedgwick, Joſeph Caryl, &c. as an aſſiſtant to the commiſſioners appointed by parliament to eject ſuch as were then called ſcandalous and ignorant miniſters and ſchoolmaſters in the city of London. After Charles II's reſtoration in 1660, it was debated by the healing parliament, for ſeveral hours together, whether he and John Goodwin ſhould be excepted for life; but the reſult was, that if Philip Nye, clerk, ſhould after the 1ſt of September, in the ſame year 1660, accept or exerciſe any office, eccleſiaſtical, civil, or military, he ſhould, to all intents and purpoſes in law, ſtand as if he had been totally excepted for life. November 1662 he was vehemently ſuſpected to be engaged in Tongue's plot: but the ſuſpicion was never proved. He died in the pariſh of St Michael's, Cornhill, London, on Sept. 27. 1672, and was buried in the upper vault of the ſaid church. Wood ſays he was a dangerous and ſeditious perſon, a politic pulpit-driver of independency, an inſatiable eſurient after riches, and what not, to raiſe a family, and to heap up wealth.

Nyland, Nyl-Ghau.

NYLAND, a province of Finland in Sweden, lying on the gulf of Finland, to the weſt of the province of Carelia.

Plate CCCXLVII.

NYL-GHAU, in zoology, of the genus *Bos*, a native of the interior parts of India. "It ſeems (ſays Bewick in his Hiſt. of Quadr.) to be of a middle nature between the cow and the deer, and carries the appearance of both in its form. In ſize, it is as much ſmaller than the one, as it is larger than the other; its body, horns, and tail, are not unlike thoſe of a bull; and the head, neck, and legs, are ſimilar to thoſe of a deer. The colour in general is aſh or gray, from a mixture of black hairs and white; all along the ridge or edge of the neck, the hair is blacker, longer, and more erect, making a ſhort, thin, and upright mane, reaching down to the hump. Its horns are ſeven inches long, ſix inches round at the root, tapering by degrees, and terminating in a blunt point: the ears are large and beautiful, ſeven inches in length, and ſpread to a conſiderable breadth; they are white on the edge and on the inſide, except where two black bands mark the hollow of the ear with a zebra-like variety. The height of this animal at the ſhoulder is four feet one inch; behind the loins, it only meaſures four feet.

"The female differs conſiderably from the male both in height and thickneſs, being much ſmaller; in ſhape and colour very much reſembling a deer; and has no horns. She has four nipples, and is ſuppoſed to go nine months with young. She commonly has one at a birth, but ſometimes two.

"Several of this ſpecies were brought to this country in the year 1767, which continued to breed annually for ſome years after. Dr Hunter, who had one of them in his cuſtody for ſome time, deſcribes it as a harmleſs and gentle animal; that it ſeemed pleaſed with every kind of familiarity, always licked the hand that either ſtroked or fed it, and never once attempted to uſe its horns offenſively. It ſeemed to have much dependence on its organs of ſmell, and ſnuffed keenly whenever any perſon came in ſight: It did ſo likewiſe when food or drink was brought to it; and would not taſte the bread which was offered, if the hand that preſented it happened to ſmell of turpentine.

"Its manner of fighting is remarkable, and is deſcribed thus. Two of the males at Lord Clive's, being put into an encloſure, were obſerved, while they were at ſome diſtance from each other, to prepare for the attack, by falling down upon their knees; they then ſhuffled towards each other, keeping ſtill upon their knees; and at the diſtance of a few yards they made a ſpring, and darted againſt each other with great force.

"The following anecdote will ſerve to ſhow, that during the rutting ſeaſon theſe animals are fierce and vicious, and not to be depended upon. A labouring man, without knowing that the animal was near him, went up to the outſide of the encloſure; the nyl-ghau, with the quickneſs of lightning darted againſt the wood work with ſuch violence, that he broke it to pieces, and broke off one of his horns cloſe to the root. The death of the animal, which happened ſoon after, was ſuppoſed to be owing to the injury he ſuſtained by the blow.

"Bernier ſays, that it is the favourite amuſement of the Mogul emperor to hunt the nyl-ghau; and that he kills them in great numbers, and diſtributes quarters of them to his omrahs; which ſhows that they are eſteemed good and delicious food.

"The nyl-ghau is frequently brought from the interior parts of Aſia, as a rare and valuable preſent to the nabobs and other great men at our ſettlements in India.

"It remains to be conſidered, whether this rare animal might not be propagated with ſucceſs in this country. That it will breed here is evident from experience; and if it ſhould prove docile enough to be eaſily trained to labour, its great ſwiftneſs and conſiderable ſtrength might be applied to the moſt valuable purpoſes."

NYMPH, in mythology, an appellation given to certain inferior goddeſſes, inhabiting the mountains, woods, waters, &c. ſaid to be the daughters of Oceanus and Tethys. All the univerſe was repreſented as full of theſe nymphs, who are diſtinguiſhed into ſeveral ranks or claſſes. The general diviſion of them is into celeſtial and terreſtrial; the former of them were called *uraniæ*, and were ſuppoſed to be intelligences that governed the heavenly bodies or ſpheres. The terreſtrial nymphs, called *epigeiæ*, preſided over the ſeveral parts of the inferior world; and were divided into thoſe of the water and thoſe of the earth. The nymphs of the water were the *oceanitides*, or nymphs of the ocean; the *nereids*, the nymphs of the ſea; the *naiads* and *ephydriades*, the nymphs of the fountains; and the *limniades*, the nymphs of the lakes. The nymphs of the earth were the *oreades*, or nymphs of the mountains; the *napææ*, nymphs of the meadows: and the *dryads* and *hamadryads*, who were nymphs of the foreſts and groves. Beſides theſe, we meet with nymphs who took their names from particular countries, rivers, &c. as the *cithæroniades*, ſo called from Mount Cithæron in Bœotia: the *dodonides*, from Dodona; *tiberiades*, from the Tiber, &c.—Goats were ſometimes ſacrificed to the nymphs; but their conſtant offerings were milk, oil, honey, and wine.

We have the following account of nymphs in Chandler's Greece. "They were ſuppoſed to enjoy longevity, but not to be immortal. They were believed to delight in ſprings and fountains. They are deſcribed as ſleepleſs, and as dreaded by the country people. They were ſuſceptible of paſſion. The Argonauts, it is related, landing on the ſhore of the Propontis to dine in their way to Colchos, ſent Hylas, a boy, for water, who diſcovered a lonely fountain, in which the nymphs Eunica, Malis, and Nycheia were preparing to dance; and theſe ſeeing him were enamoured, and, ſeizing him by the hand as he was filling his vaſe, pulled him in. The deities, their copartners in the cave, are ſuch as preſided with them over rural and paſtoral affairs.

"The old Athenians were ever ready to cry out, A god! or a goddeſs! The tyrant Piſiſtratus entered the city in a chariot with a tall woman dreſſed in armour to reſemble Minerva, and regained the Acropolis, which he had been forced to abandon, by this ſtratagem; the people worſhipping, and believing her to be the deity whom ſhe repreſented. The nymphs, it was the popular perſuaſion, occaſionally appeared; and nympholepſy is characterized as a frenzy, which aroſe from having beheld them. Superſtition diſpoſed the mind to adopt deluſion for reality, and gave to a fancied viſion the efficacy of full conviction. The foundation was perhaps no more than an indirect, partial, or obſcure view of ſome harmleſs girl, which had approached the fountain on a like errand with Hylas, or was retiring after ſhe had filled her earthen pitcher.

"Among the ſacred caves on record, one on Mount Ida in Crete was the property of Jupiter, and one by Lebadea in Bœotia of Trophonius. Both theſe were oracular, and the latter bore ſome reſemblance to that we have deſcribed. It was formed by art, and the mouth ſurrounded with a wall. The deſcent to the landing place was by a light and narrow ladder, occaſionally applied and removed. It was ſituated on a mountain above a grove, and they related, that a ſwarm of bees conducted the perſon by whom it was firſt diſcovered. But the common owners of caves were the nymphs, and theſe were ſometimes local. On Cithæron in Bœotia, many of the inhabitants were poſſeſſed by nymphs called *Sphragitides*, whoſe cave, once alſo oracular, was on a ſummit of the mountain. Their dwellings had generally a well or ſpring of water; the former often a collection of moiſture condenſed or exuding from the roof and ſides; and this, in many inſtances, being pregnant with ſtony particles, concreted, and marked its paſſage by incruſtation, the ground work in all ages and countries of idle tales framed or adopted by ſuperſtitious and credulous people.

"A cave in Paphlagonia was ſacred to the nymphs who inhabited the mountains about Heraclea. It was long and wide, and pervaded by cold water, clear as cryſtal. There alſo were ſeen bowls of ſtone, and nymphs and their webs and diſtaffs, and curious work, exciting admiration. The poet who has deſcribed this grotto, deſerves not to be regarded, as ſervilely copying Homer; he may juſtly claim to rank as an original topographer.

"The piety of Archidamus furniſhed a retreat for the nymphs, where they might find ſhelter and proviſion, if diſtreſſed; whether the ſun parched up their trees, or Jupiter enthroned in clouds upon the mountain top ſeared them with his red lightning and terrible thunder, pouring down a deluge of rain, or brightening the ſummits with his ſnow."

NYMPH, among naturaliſts, that ſtate of winged inſects between their living in the form of a worm and their appearing in the winged or moſt perfect ſtate.

The eggs of inſects are firſt hatched into a kind of worms or maggots; which afterwards paſs into the nymph ſtate, ſurrounded with ſhells or caſes of their own ſkins; ſo that, in reality, theſe nymphs are only the embryo inſects, wrapped up in this covering; from whence they at laſt get looſe, though not without great difficulty.

During this nymph ſtate the creature loſes its motion. Swammerdam calls it *nympha aurelia*, or ſimply *aurelia*; and others give it the name of *chryſalis*, a term of the like import. See the article CHRYSALIS.

NYMPH-Bank, ſituated about 10 leagues off the coaſt of the county of Waterford, and province of Munſter in Ireland, is a great fiſhing place, and 11 leagues S. S. E. from the high head of Dungarvan. It abounds with cod, ling, ſkate, bream, whiting, and other fiſh; which was diſcovered by Mr Doyle, who on July 15. 1736 ſailed to it, in company with ſeven men, on board the Nymph, a ſmall veſſel of about 12 guns. This place is well adapted for a fiſhing company, the great public advantages of which muſt be very evident.

NYMPHÆ, in anatomy, two membranaceous parts, ſituated on each ſide the rima. They are of a red colour, and cavernous ſtructure, ſomewhat reſembling the wattles under a cock's throat. They are ſometimes ſmaller, ſometimes larger; and are continuous to the præputium of the clitoris, and joined to the anterior ſide of the labia.

NYMPHÆA, the WATER-
monogynia order, belonging to the
plants; and in the natural method
54th order, *Miſcellaneæ*. The corolla
the calyx tetraphyllous or pent
multilocular and truncated.
of which the moſt remarkable
and alba, or yellow and white [illegible] of which are natives of Britain, growing in lakes and ditches. Linnæus tells us, that ſwine are fond of the leaves and roots of the former; and that the ſmoke of it will drive away crickets and blattæ, or cockroaches, out of houſes.—The root of the ſecond has an aſtringent and bitter taſte, like thoſe of moſt aquatic plants that run deep into the mud. The Highlanders make a dye with it of a dark cheſnut colour. 3. The lotus, with heart-ſhaped toothed leaves, a plant thought to be peculiar to Egypt, is thus mentioned by Herodotus †: "When the river Nile is become full, and all the grounds round it are a perfect ſea, there grows a vaſt quantity of lilies, which the Egyptians call *lotus*, in the water. After they have cut them, they dry them in the ſun, then having parched the ſeed within the lotus, which is moſt like the poppy, they make bread of it, baking it with fire. The root alſo of the lotus is eatable, eaſily becoming ſweet, being round, and of the ſize of an apple." M. Savary ‡ mentions it as growing in the rivulets and on the ſides of the lakes; and that there are two ſorts or varieties of the plant, the one with a white, the other with a bluiſh flower. "The calyx (he ſays) blows like a large tulip, and diffuſes a ſweet ſmell, reſembling that of the lily. The firſt ſpecies produces a round root like that of a potato, and the inhabitants of the banks of the lake Menzall feed upon it. The rivulets in the environs of Damietta are covered with this majeſtic flower, which riſes upwards of two feet above the water. 4. In the Eaſt and Weſt Indies grows a ſpecies of this plant, named *nelumbo* by the inhabitants of Ceylon. The leaves which reſt upon the ſurface of the water are ſmooth, undivided, perfectly round, thick, target ſhaped, and about one foot and a half in diameter. The footſtalk of the leaves is prickly, and inſerted, not into their baſe, or margin, as in moſt plants, but in the centre of the lower diſk or ſurface. From this centre, upon the upper ſurface, iſſue like rays, a great number of large ribs or nerves, which towards the circumference are divided and ſubdivided into a ſmall number of very minute parts. The flowers are large, fleſh coloured, and conſiſt of numerous petals, diſpoſed, as in the other ſpecies of water lily, in two or more rows. The ſeed veſſel is ſhaped like a top, being broad and circular above, narrow and almoſt pointed below. It is divided into ſeveral diſtinct cells, which form ſo many large round holes upon the ſurface of the fruit; each containing a ſingle ſeed.—With the flower of this plant, which is ſacred among the heathens, they adorn the altars of their temples: they paint their gods ſitting upon it; and make uſe of ſuch pictures to animate the minds of the pious on their deathbed, and to raiſe their affections to heaven. The ſtalks, which are uſed as a pot herb, are of a wonderful length. The root is very long, extends itſelf tranſverſely, is of the thickneſs of a man's arm, jointed and fibrous, with long intervals betwixt the joints. The fibres ſurround the joints in verticilli or whirls. 5. A ſpecies of nymphæa, called by the Chineſe *lien hoa* and *nenufar*, is highly extolled in that country for its excellent virtues, and ranked by their phyſicians among thoſe plants which are employed in the compoſition of *the liquor of immortality*. The ſeeds are there eaten as we eat filberds in Europe: they are more delicate when they are green, but harder of digeſtion; they are preſerved in many different ways with ſugar. The root of this plant is alſo admitted by the Chineſe to their tables: in whatever manner it be prepared, it is equally wholeſome. Great quantities of it are pickled with ſalt and vinegar, which they preſerve to eat with their rice. When reduced to powder, it makes excellent ſoup with water and milk. The leaves of the nenufar are much uſed for wrapping up fruits, fiſh, ſalt proviſions, &c. When dry, the Chineſe mix them with their ſmoking tobacco, to render it ſofter and milder.

The high veneration in which the *nymphæa lotos* was held by the Egyptians, is fully known; and at this hour it is equally venerated by the Hindoos. Sir William Jones, in ſpeaking of Brahma, Viſhnu, and Shiva, as emblematical repreſentations of the Deity, ſays,

"The firſt operations of theſe three powers are evidently deſcribed in the different Puranas by a number of allegories; and from them we may deduce the Ionian philoſophy of primæval water, the doctrine of the mundane egg, and the veneration paid to the nymphæa or lotos, which was anciently revered in Egypt, as it is at preſent in Hindoſtan, Thibet, and Nepal. The Thibetians are ſaid to embelliſh their temples and altars with it; and a native of Nepal made proſtrations before it on entering my ſtudy where the fine plant and beautiful flowers lay for examination."

NYMPHÆA (amongſt the ancients), doubtful what ſtructures they were, ſome take them to have been grottos, deriving their name from the ſtatues of the nymphs with which they were adorned, but that they were conſiderable works appears from their being executed by the emperors, (Ammian, Victor, Capitolinus) or by the city prefects. In an inſcription, the term is written *nymfium*. None of all theſe nymphæa has laſted down to our time. Some years ſince, indeed, a ſquare building of marble was diſcovered between Naples and Veſuvius, with only one entrance, and ſome ſteps that went down to it. On the right hand as

† *Euterpe*, c. 92.

‡ *Letters on Egypt*, Vol I.

you enter, towards the head, there is a fountain of the pureſt water; along which, by way of guard as it were, is laid a naked Arethuſa of the whiteſt marble; the bottom or ground is of variegated marble, and encompaſſed with a canal fed by the water from the fountain: the walls are ſet round with ſhells and pebbles of various colours; by the ſetting of which, as by ſo many ſtrokes in a picture, are expreſſed the 12 months of the year, and the four political virtues; alſo the rape of Proſerpine; Pan playing on his reed, and ſoothing his flock; beſides the repreſentations of nymphs ſwimming, ſailing, and wantoning on fiſhes, &c.

It ſeems pretty evident that the nymphæa were public baths; for at the ſame time that they were furniſhed with pleaſing grottos, they were alſo ſupplied with cooling ſtreams, by which they were rendered exceedingly delightful, and drew great numbers of people to frequent them. Silence ſeems to have been a [illegible]lar requiſite there, as appears by this inſcription, *Nymphis loci, bibe, lava, tace.* That building between Naples and Veſuvius mentioned above, was certainly one of theſe nymphæa.

NYMPHÆUM, (Plutarch); the name of a ſacred place, near Apollonia in Illyricum, ſending forth continually fire in detached ſtreams from a green valley and verdant meadows. Dio Caſſius adds, that the fire neither burns up nor parches the earth, but that herbs and trees grow and thrive near it, and therefore the place is called *nymphæum:* near which was an oracle of ſuch a nature, that the fire, to ſhow that the wiſh was granted, conſumed the frankincenſe thrown into it; but repelled it, in caſe the deſire was rejected. It was there that a ſleeping ſatyr was once caught and brought to Sylla as he returned from the Mithridatic war. This monſter had the ſame features as the poets aſcribe to the ſatyr. He was interrogated by Sylla and by his interpreters; but his articulations were unintelligible, and the Roman ſpurned from him a creature which ſeemed to partake of the nature of a beaſt more than that of a man.

Nymphæum, in antiquity, a public hall magnificently decorated, for entertainments, &c. and where thoſe who wanted convenience at home held their marriage feaſts; whence the name.

NYMPHIDIUS (Sabinus), a perſon of mean deſcent, but appointed by Nero colleague of Tigellinus in the command of the prætorian guards. About the time, however, that the German legions revolted from this deſpicable prince, he was alſo betrayed by Nymphidius and abandoned by his guards.

Nymphidius began now to entertain thoughts of ſeizing the ſovereignty himſelf. However, he did not immediately declare his ambitious views; but pretending to eſpouſe the cauſe of Galba, aſſured the guards that Nero was fled, and promiſed them ſuch ſums as neither Galba nor any other was able to diſcharge. This promiſe ſecured for the preſent the empire to Galba, occaſioned afterwards the loſs of it, and, finally, produced the deſtruction of Nymphidius and the guards themſelves. After Nero's death, however, and on the acknowledgment of Galba as emperor, he renewed his ambition; and having, by his immenſe largeſſes, gained the affections of the prætorian guards, and perſuading himſelf that Galba, by reaſon of his infirmities and old age, would never reach the capital, uſurped all the authority at Rome. Preſuming upon his intereſt, he obliged Tigellinus, who commanded, jointly with him, the prætorian guards, to reſign his commiſſion. He made ſeveral magnificent and expenſive entertainments, inviting ſuch as had been conſuls or had commanded armies, diſtributed large ſums among the people, and with ſhows and other diverſions, which he daily exhibited, gained ſo great an intereſt with all ranks, that he already looked upon himſelf as ſoverign. The ſenate, dreading his power, conferred extraordinary honours upon him, ſtyled him their *protector*, attended him when he appeared in public, and had recourſe to him for the confirmation of their decrees, as if he had been already inveſted with the ſovereign power. This baſe compliance [illegible] to ſuch a degree, that he uſurped, not [illegible] by degrees, but all at once, an abſolute [illegible]. He acted as ſovereign indeed, but he had [illegible] yet openly declared his deſign of ſeizing the [illegible] his power however was great, and he uſed [illegible] undermining Galba's power; he was, however, unſucceſsful, and the diſcloſure of his deſigns was much againſt him. Galba was again acknowledged and proclaimed; and he, notwithſtanding his artifices, detected and ſlain by the ſoldiers who were proclaiming Galba. See Nero.

NYON, a conſiderable town of Switzerland, in the canton of Bern, and capital of a bailiwick of the ſame name, with a caſtle. It ſtands delightfully upon the edge of the lake of Geneva, in the very point where it begins to widen, and in a moſt charming country commonly called *Pays de Vaud.* It was formerly called *Colonia Equeſtris Noiodunum;* and, as a proof of its antiquity, ſeveral Roman inſcriptions, and other ancient remains have been frequently diſcovered in the outſkirts of the town. E. Long. 5. 10. N. Lat. 46. 24.

NYSA, or Nyssa (anc. geog.), a town of Ethiopia, at the ſouth of Egypt. Some place it in Arabia. This city, with another of the ſame name in India, was ſacred to the god Bacchus, who was educated there by the nymphs of the place, and who received the name of *Dionyſus*, which ſeems to be compounded of Διος and Νυσα, the name of his father, and that of the place of his education. The god made this place the ſeat of his empire, and the capital of the conquered nations of the eaſt. According to ſome geographers, there were no leſs than ten places of this name. One of theſe was famous on the coaſt of Eubœa for its vines, which grew in ſuch an uncommon manner, that if a twig was planted in the ground in the morning, it immediately produced grapes which were full ripe in the evening. A city of Thrace: another ſeated on the top of Mount Parnaſſus, and ſacred to Bacchus.

NYSLOT, a ſtrong town of Ruſſia, in Livonia, with a caſtle; ſeated on the river Narva, among large marſhes. E. Long. 26. 55. N. Lat. 58. 46.

NYSSA, in botany: A genus of the order of diœcia, belonging to the polygamia claſs of plants; and in the natural method ranking under the 12th order, *Holoraceæ.* The hermaphrodite calyx is quinquepartite; there is no corolla; the ſtamina are five; there is one piſtil; the fruit a plum inferior. The male calyx is quinquepartite, no corolla, and ten ſtamina.

Nyſſa.

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Planting and Gardening.

The entire-leaved tupelo tree, in its native ſoil and climate, grows to near 20 feet high; in this country its ſize varies according to the nature of the ſoil or ſituation. In a moiſt rich earth, well ſheltered, it comes near to 20 feet; in others, that are leſs ſo, it makes ſlower progreſs, and in the end is proportionally lower. The branches are not very numerous, and it riſes with a regular trunk, at the top of which they generally grow. The leaves are of a lanceolated figure, and of a fine light green colour. They [illegible] points, and are very ornamental, of a thick[illegible]ence, ſoft, grow alternately on pretty long [illegible] and often retain their verdure late in the [illegible]. The flowers, which are not very ornamental, [illegible]duced from the ſides of the branches, growing [illegible] ſingly, ſometimes many together, on a [illegible] They are of a greeniſh colour; and, in the [illegible] where they naturally grow, are ſucceeded [illegible] encloſing oval, acute, furrowed nuts. [illegible] they ſeldom produce fruit.

The ſerrated-leaved tupelo tree grows uſually nearly 30 feet in height; and divides into branches near the top like the other. The leaves are oblong, pointed, of a light green colour, and come out without order on long footſtalks. The flowers come out from the wings of the leaves on long footſtalks. They are ſmall, of a greeniſh colour; and are ſucceeded by oval drupes, containing ſharp-pointed nuts, about the ſize of a French olive.

The propagation of theſe trees is from ſeeds, which come from America. As ſoon as they arrive, they ſhould be ſown in large pots of light ſandy earth an inch deep. The gardener (no plants come up the firſt ſpring), after this work is done, ſhould plunge his pots up to their rims in the natural ground; and if it be a moiſt place, it will be the better. Weeding muſt be obſerved during the ſummer; and a few furze-buſhes ſhould be pricked round the pots in November, which will prevent the ground from freezing, and forward the coming up of the ſeeds. In the next ſpring, the pots ſhould be plunged into an hotbed, and after that the ſeeds will ſoon appear. As much air as poſſible, and watering, ſhould be afforded them; and they muſt be hardened ſoon, to be ſet out. The pots ſhould then be plunged to their rims again in the natural mould; where they are to remain till October. Watering muſt be given them; and they ſhould alſo be ſhaded in the heat of the day. In October, they [illegible] be houſed, with other greenhouſe plants, or elſe ſet under a hot-bed frame, or ſome other cover, during winter. The third ſpring they ſhould be taken out of the larger pots, and each planted in a ſmaller, in which their growth may be aſſiſted by a gentle heat in a bed; but if they are planted up to the rims in a moiſt place, and ſhaded in dry weather, they will grow very well. Though by this time they ſhould have become hardy, yet it will be proper to ſhelter them the winter following in bad weather. They will require little more care during their ſtay in the pots, which may be either two, three, or more years, if they are large enough; when in ſpring they may be turned out, with the mould, into the places where they are to remain, which ought always to be moiſt and properly ſheltered.

Nyſſa, Nyu-che.

NYU-CHE, or KIN, an empire which aroſe in Eaſtern Tartary in the beginning of the 13th century. From the founder of this empire the late Chineſe emperor Kang-hi ſaid that his family was deſcended. See CHINA and TARTARY.

O.

O, The 14th letter and fourth vowel of our alphabet; pronounced as in the words *noſe*, *roſe*, &c.

The ſound of this letter is often ſo ſoft as to require it double, and that chiefly in the middle of words; as *gooſe*, *reproof*, &c. And in ſome words, this *oo* is pronounced like *u* ſhort, as in *flood*, *blood*, &c.

As a numeral, O was ſometimes uſed for 11 among the ancients; and with a daſh over it thus, Ō, for 11,000.

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It is not, ſtrictly ſpeaking, the letter O, but the figure of a circle O, or double CƆ, by which the modern ancients in muſic uſed to expreſs what they called *tempo perfecto*, or triple time. Hence the Italians call it *circolo*.

The ſeven antiphones, or alternate hymns of ſeven verſes, &c. ſung by the choir in the time of Advent, were formerly called *O*, from their beginning with ſuch an exclamation.

O is an adverb of calling, or interjection of ſorrow or wiſhing.

OAK, in botany. See Quercus.

The oak has been long known by the title of *monarch of the woods*, and very juſtly. It was well known, and often very elegantly deſcribed, by the ancient poets. The following deſcription from Virgil is exquiſite:

Veluti annoſo validam cum robore quercum
Alpini Boreæ, nunc hinc, nunc flatibus illinc
Eruere inter ſe certant: it ſtridor, et altæ
Conſternunt terram concuſſo ſtipite frondes;
Ipſa hæret ſcopulis; et quantum vertice ad auras
Ætherias, tantum radice in Tartara tendit.

Æn. iv. 441.

As o'er th' aerial Alps ſublimely ſpread,
Some aged *oak* uprears his reverend head;
This way and that the furious tempeſts blow,
To lay the monarch of the mountains low;
Th' imperial plant, though nodding at the ſound,
Though all his ſcatter'd honours ſtrew the ground;
Safe in his ſtrength, and ſeated on the rock,
In naked majeſty defies the ſhock:
High as the head ſhoots tow'ring to the ſkies,
So deep the root in hell's foundation lies.

Pitt.

The ancient druids had a moſt profound veneration for oak trees. Pliny † ſays, that "the druids (as the Gauls call their magicians or wiſe men) held nothing ſo ſacred as the miſletoe, and the tree on which it grows, provided it be an oak. They make choice of oak groves in preference to all others, and perform no rites without oak leaves; ſo that they ſeem to have the name of druids from thence, if we derive their name from the Greek," &c. (See Druids—definition, and N° 11.) Maximus Tyrius ſays the Celtæ or Gauls worſhipped Jupiter under the figure of a lofty oak (a).

† Nat. Hiſt. xvi. c. 44

This uſeful tree grows to ſuch a ſurpriſing magnitude, that were there not many well authenticated inſtances of them in our own country, they would certainly appear difficult of belief. In the 18th volume of the Gentleman's Magazine we have the dimenſions of a leaf twelve inches in length and ſeven in breadth, and all the leaves of the ſame tree were equally large. On the eſtate of Woodhall, purchaſed in 1775 by Sir Thomas Rumbold, Bart. late governor of Madras, an oak was felled which ſold for 43l. and meaſured 24 feet round. We are alſo told of one in Millwood foreſt, near Chaddeſly, which was in full verdure in winter, getting its leaves again after the autumn ones fell off." In Hunter's Evelyn's Sylva, we have an account of a very remarkable oak at Greendale; which Gough, in his edition of Camden, thus minutely deſcribes: "The Greendale oak, with a road cut through it, ſtill bears one green branch. Such branches as have been cut or broken off are guarded from wet by lead. The diameter of this tree at the top, whence the branches iſſue, is 14 feet 2 inches; at the ſurface of the ground 11¼ feet; circumference there 35 feet; height of the trunk [illegible]; height of the arch 10, width 6. Mr Evelyn mentions ſeveral more oaks of extraordinary ſize in Workſop park."

In the Gentleman's Magazine for 1773 we have an account of [illegible] differing very eſſentially from the common one [illegible] frequent about St Thomas in Devonſhire, and is in [illegible] county called *Lucombe* oak, from one William [illegible]combe who ſucceſsfully cultivated it near Exeter. [illegible] grows as ſtraight and handſome as a fir; its leaves [illegible] evergreen, and its wood as hard as that of [illegible] common oak. Its growth is ſo quick, as to exceed [illegible] 40 years the altitude and girth of the common [illegible] 100. It is cultivated in various places; Cornwall, Somerſetſhire, &c.

Mr du Hamel du Monceau, of the Royal Academy of Sciences at Paris (who wrote a treatiſe on huſbandry), gave an account in the year 1749 of an oak which he had kept in water eight years, and which yielded fine leaves every ſpring. The tree had, he ſays, four or five branches; the largeſt 19 or 20 lines round, and more than 18 inches long. It throve more in the two firſt years than it would have done in the beſt earth; it afterwards loſt its vigour, and rather decayed; which he attributed to a defect in the roots rather than to a want of aliment.

M. de Buffon made ſome experiments on oak trees; the reſult of which is recorded in the Gentleman's Magazine, 1754. He had compared barked with unbarked trees; and proves, we think with ſucceſs, from a variety of trials, that timber barked and dried ſtanding, is always heavier and conſiderably ſtronger than timber kept in its bark.

The bark of oak trees was formerly thought to be extremely uſeful in vegetation. One load (Mr Mills in his Treatiſe on Huſbandry informs us) of oak bark, laid in a heap and rotted, after the tanners have uſed it for dreſſing of leather, will do more ſervice to ſtiff cold land, and its effects will laſt longer, than two loads of the richeſt dung; but this has been ſtrenuouſly controverted. (See *Oak Leaves*.)

The bark, in medicine, is alſo a ſtrong aſtringent; and hence ſtands recommended in hæmorrhagies, alvine fluxes, and other preternatural or immoderate ſecretions; and in theſe it is ſometimes attended with good effects. Some have alleged, that by the uſe of this bark every purpoſe can be anſwered which may be obtained from Peruvian bark. But after ſeveral very fair trials, we have by no means found this to be the caſe. Beſides the bark, the buds, the acorns and their cups are uſed; as alſo the galls, which are excreſcences cauſed by inſects on the oaks of the eaſtern countries, of which there are divers ſorts; ſome perfectly round and ſmooth, ſome rougher with ſmall protuberances, but all generally having a round hole in them. All the parts of the oak are ſtyptic, binding, and uſeful in all kinds of fluxes and bleedings, either inward or outward. The bark is frequently uſed in gargariſms, for the relaxation of the uvula, and for ſore mouths and throats: it is alſo uſed in reſtringent clyſters and injections, againſt the pr[illegible] ani. The acorns, beaten to powder, are taken by the vulgar for pains in the ſide. [illegible] officinal preparation is the aqua [illegible]

(a) Camden informs us of a tradition (which, like moſt other traditions of this nature, ſeems to be founded in ignorance and foſtered by credulity) reſpecting an oak near Malwood caſtle, where Rufus was killed, viz. that it budded on Chriſtmas day, and withered before night. This tree, the ſame tradition reports to have been that againſt which Tyrrel's arrow glanced.

Oak Leaves. The uſes of oa[illegible] anning, in hot-beds, is generally known. [illegible] theſe purpoſes, however, oak leaves [illegible] anſwer equally well, or rather better. [illegible] notes to Dr Hunter's edition of Evelyn's T[illegible] Trees, we find the following directions [illegible] W. Speechly: The leaves are to be [illegible] as poſſible after they fall from the [illegible] into heaps, they ſhould immediat[illegible] ſome place near the hot-houſes, wher[illegible] couch. Mr Speechly ſays, it was his cuſtom [illegible] them round with charcoal hurdles, or any thing elſe, to keep them from being blown about the garden in windy weather. In this place they tread them well, and water them in caſe they happen to have been brought in dry. The heap is made ſix or ſeven feet thick, and covered over with old mats, or any thing elſe, to prevent the upper leaves from being blown away. In a few days the heap will come to a ſtrong heat. For the firſt year or two in which he uſed theſe leaves, our author did not continue them in the heap longer than ten days or a fortnight: but by this method of management they ſettled ſo much when brought to the hot-houſe, that a ſupply was very ſoon required; and he afterwards found, that it was proper to let them remain five or ſix weeks in the heaps before they are brought to the hot-houſe. In getting them into the pine pots, if they appear dry, they are to be watered, and again trodden down exceedingly well, in layers, till the pits are quite full. The whole is then covered with tan bark, to the thickneſs of two inches, and well trodden down, till the ſurface becomes ſmooth and even. On this the pine pots are to be placed in the manner they are to ſtand, beginning with the middle row firſt, and filling up the ſpaces between the pots with tan. In this manner we are to proceed to the next row, till the whole be finiſhed; and this operation is performed in the ſame manner as when tan only is uſed. The leaves require no farther trouble through the whole ſeaſon; as they will retain a conſtant and regular heat for 12 months without ſtirring or turning; and our author inform us, that if he may judge from their appearance when taken out (being always entire and perfect), it is probable they would continue their heat through a ſecond year; but, as an annual ſupply of leaves is eaſily obtained, the experiment is hardly worth making. After this, the pines will have no occaſion to be moved but at ſtated times of their management, viz. at the ſhifting them in their pots, &c. when at each time a little freſh tan ſhould be added to make up the deficiency ariſing from the ſettling of the beds; but this will be inconſiderable, as the leaves do not ſettle much after their long couching. During the firſt two years of our author's practice he did not uſe any tan, but plunged the pine pots into the leaves, and juſt covered the ſurface of the beds, when finiſhed, with a little ſaw-duſt, to give it a neatneſs. This method, however, was attended with one inconvenience; for, by the caking of the leaves they ſhrunk from the ſides of the pots, whereby they became expoſed to the air, and at the ſame time the heat of the beds was permitted to eſcape.

“ Many powerful reaſons (ſays Mr Speechly) may be given why oak leaves are preferable to tanners bark.

“ 1. They always heat regularly; for during the whole time that I have uſed them, which is near ſeven [illegible] I never once knew of their heating with violence; and this is ſo frequently the caſe with tan, that I affirm, and indeed it is well known to every perſon converſant in the management of the hot-houſe, that pines ſuffer more from this one circumſtance, than all the other accidents put together, inſects excepted.—When this accident happens near the time of their fruiting, the effect is ſoon ſeen in the fruit, which is exceedingly ſmall and ill-ſhaped. Sometimes there will be little or no fruit at all; therefore gardeners who make uſe of tan only for their pines, ſhould be moſt particularly careful to avoid an over heat at that critical juncture—the time of ſhowing the fruit.

“ 2. The heat of oak leaves is conſtant; whereas tanner's bark generally turns cold in a very ſhort time after its furious heat is gone off. This obliges the gardener to give it frequent turnings in order to promote its heating. Theſe frequent turnings, not to mention the expence, are attended with the worſt conſequences; for by the continual moving of the pots backwards and forwards, the pines are expoſed to the extremes of heat and cold, whereby their growth is conſiderably retarded; whereas, when leaves are uſed, the pines will have no occaſion to be moved but at the times of potting, &c. The pines have one peculiar advantage in this undiſturbed ſituation; their roots grow through the bottoms of the pots, and mat among the leaves in a ſurpriſing manner. From the vigour of the plants when in this ſituation, it is highly probable that the leaves, even in this ſtate, afford them an uncommon and agreeable nouriſhment.

“ 3. There is a ſaving in point of expence; which is no inconſiderable object in places where tan cannot be had but from a great diſtance.

“ 4. The laſt ground of preference is, that decayed leaves make good manure; whereas rotten tan is experimentally found to be of no value. I have often tried it both on ſand and clay, and on wet and dry land; and never could diſcover in any of my experiments, that it deſerved the name of a manure; whereas decayed leaves are the richeſt, and of all others the moſt proper manure for a garden. Leaves mixed with dung make excellent hot-beds; and I find that beds compounded in this manner, preſerve their heat much longer than when made entirely with dung; and [illegible] both caſes, the application of leaves will be a conſiderable ſaving of dung, which is a circumſtance on many accounts agreeable."

Oak-Leaf Galls. Theſe are of ſeveral kinds; the remarkable ſpecies called the *muſhroom gall* is never found on any other vegetable ſubſtance but theſe leaves: and beſide this there are a great number of other kinds.

The double gall of theſe leaves is very ſingular, becauſe the generality of productions of this kind affect only one ſide of a leaf or branch, and grow all one way: whereas this kind of gall extends itſelf both ways, and is ſeen on each ſide of the leaf, in form of two protuberances, oppoſite the one to the other. Theſe are of differently irregular ſhapes, but their natural figure ſeems that of two cones, with broad baſes, and very obtuſe points, though ſometimes they are round, or very nearly ſo.

Theſe make their firſt appearance on the leaf in April, and remain on it till June or longer. They are at firſt green, but afterwards yellowiſh, and are ſofter to the touch than many other of the productions of this kind: they are uſually about the ſize of a large pea, but ſometimes they grow to the bigneſs of a nut. When opened, they are found to be of that kind which are inhabited each by one inſect only, and each contains one cavity. The cavity in this is, however, larger than in any other gall of the ſize, or even in many others of three times the ſize; the ſides of it being very little thicker than the ſubſtance of the leaf.

It is not eaſy to aſcertain the origin of the ſeveral ſpecies of flies which are at times ſeen in this manner to come out of the ſame ſpecies of galls. It ſeems the common courſe of nature, that only one ſpecies of inſect forms one kind of gall; yet it may be, that two or three kinds may give origin to the ſame kind. There is, however, another occaſion of our ſeeing different ſpecies come out of different galls of the ſame kind: and this is the effect of the enemies of the proper inhabitants.

It might appear that the parent fly, when ſhe had formed a gall for the habitation of her worm offspring, had placed it in an impregnable fortreſs; but this is not the caſe; for it frequently happens, that a fly, as ſmall perhaps as that which gave origin to the gall, produces a worm which is of the carnivorous kind, as the other feeds on vegetable juices. This little fly, well knowing that where there is one of theſe protuberances on a leaf, there is a tender and defenceleſs inſect within, pierces the ſides of the gall, and depoſites her egg within it. This, when it hatches into a worm, feeds upon the proper inhabitant; and finally, after devouring it, paſſes into the chryſalis ſtate, and thence appears in the form of its parent fly, and is ſeen making its way out of the gall, in the place of the proper inhabitant.

On opening theſe leaf-galls, which are properly the habitation only of one animal, it is common to find two, the ſtronger preying upon the body of the other, and ſucking its juices as it does thoſe of the leaf: often it is found wholly employed in devouring its unoffending neighbour at once: this is probably the caſe when its time of eating is nearly over; and, in fine, where we find the gall inhabited by only one inſect, or containing only one chryſalis, as it ought in its natural ſtate to do, we are never certain that this is the proper inhabitant, as it may be one of theſe deſtroyers who has eaten up the other, and ſupplied its place. See Aphis and *Oak Pucaron*.

Oak Saw-duſt is now found to anſwer the purpoſes of tanning, as well, at leaſt, as the bark. See Tanning.

Oak of Jeruſalem. See Chenopodium.

OAKHAM, Ockham, or *Oakum*, in ſea-language, denotes the matter of old ropes untwiſted and pulled out into looſe hemp, in order to be uſed in caulking the ſeams, tree-nails, and bends of a ſhip, for ſtopping or preventing leaks.

OAKHAMPTON, a town of Devonſhire, which ſends two members to parliament; ſituated in W. Long. 4. 5. N. Lat. 50. 48.

OANNES, a being in Chaldean mythology, repreſented as half a man and half a fiſh. According to Beroſus and other fabulous writers, this monſter was the civilizer of the Chaldeans; to whom he taught a ſyſtem of juriſprudence ſo perfect as to be incapable of improvement. In diſcharging the duties of his office, he ſpent the day on dry land, but retired every night into the ocean or the river. See Mythology, N° [illegible].

OAR, a long piece of timber, flat at one end and round or ſquare at the other; and which being applied to the ſide of a floating veſſel, ſerves to make it advance upon the water.

That part of the oar which is out of the veſſel, and which enters into the water, is called the *blade*, or *waſh-plat*; and that which is within board is termed the *loom*, whoſe extremity being ſmall enough to be graſped by the rowers, or perſons managing the oars, is called the *handle*.

To puſh the boat or veſſel forwards by means of this inſtrument, the rowers turn their backs forward, and, dipping the blade of the oar in the water, pull the handle forward ſo that the blade at the ſame time may move aft in the water: but ſince the blade cannot be ſo moved, without ſtriking the water, this impulſion is the ſame as if the water were to ſtrike the blade from the ſtern towards the head: the veſſel is therefore neceſſarily moved according to this direction. Hence it follows, that ſhe will advance with the greater rapidity, by as much as the oar ſtrikes the water more forcibly. Thus it is evident, that an oar acts upon the ſide of a boat or veſſel like a lever of the ſecond claſs, whoſe fulcrum is the ſtation upon which the oar reſts on the boat's gunnel. In large veſſels, this ſtation is uſually called the *row-port*; but in lights and boats it is always termed the *row-lock*.

OARISTUS, or Oaristys, a term in the Greek poetry, ſignifying a dialogue between a huſband and his wife; ſuch as that in the ſixth book of the Iliad between Hector and Andromache.

Scaliger obſerves, that the oariſtus is not properly any particular little poem, or entire piece of poetry; but always a part of a great one. He adds, that the paſſage now cited in Homer is the only proper oariſtus extant in the ancient poets.

OAT, in botany. See Avena.

Under the word Avena it was obſerved, that the native place of the common oat, cultivated in our fields, is unknown; that the only account of it, in its natural ſtate, which we then had, is in Anſon's Voyage; and that the report of ſuch an author reſpecting facts in natural hiſtory is not entitled to implicit credit. We had not then ſeen the Travels of Mr Bruce, whoſe botanical knowledge is very ſuperior to that of moſt voyagers, or we ſhould have mentioned his account of the oats which he found growing wild in Arooſſi, a ſmall territory in Abyſſinia, not far from the ſource of the Nile: (See Nile). "Wild oats (ſays he) grow up here ſpontaneouſly to a prodigious height and ſize, capable often of concealing both the horſe and his rider, and ſome of the ſtalks being little leſs than an inch in circumference. They have, when ripe, the appearance of ſmall canes. The inhabitants make no ſort of uſe of this grain in any period of its growth: the uppermoſt thin huſk of it is beautifully variegated with a changeable purple colour; the [illegible] perfectly good. I often made the meal into cakes in remembrance of Scotland." Our author informs us that the Abyſſinians could never be brought to eat theſe cakes, which they ſaid were bitter, [illegible] ſtomachs, and made them thirſty. He is, however, decidedly of opinion, that the wild oat of Arooſſi is the oat in its original ſtate; and that it [illegible] everywhere in Europe. From the [illegible] ſtates, this opinion ſeems to be well founded.

OATH, an affirmation or promiſe, accompanied with an invocation of God to witneſs what we ſay; and with an imprecation of his vengeance, or a renunciation of his favour, if what we affirm be falſe, or what we promiſe be not performed (a).

The laws of all civilized ſtates have required the ſecurity of an oath for evidence given in a court of juſtice, and on other occaſions of high importance (b); and the Chriſtian religion utterly prohibits ſwearing, except when oaths are required by legal authority. Indeed no ſerious and reflecting theiſt, whether he admit the truth of revelation or not, can look upon ſwearing on trivial occaſions as any thing elſe than a ſin of a very heinous nature. To call upon that infinite and omnipreſent Being, who created and ſuſtains the univerſe, to witneſs all the impertinence of idle converſation, of which great part is commonly uttered at *random*, betrays a ſpirit ſo profane, that nothing ſhort of experience could make us believe it poſſible for a creature endowed with reaſon and reflection to be habitually guilty of a practice ſo impious. No man can plead in extenuation of this crime, that he is tempted to ſwear by the importunity of any appetite or paſſion implanted in the human breaſt: for the utterance of a profane oath communicates no pleaſure, and removes no uneaſineſs: it neither elevates the ſpeaker, nor depreſſes the hearer.

Quakers and *Moravians*, ſwayed by theſe conſiderations, and by the ſenſe which they put upon certain texts of Scripture, refuſe to ſwear upon any occaſion, even at the requiſition of a magiſtrate, and in a court of juſtice. Theſe ſcruples are groundleſs; and ſeem to proceed from an incapacity to diſtinguiſh between the proper uſe and abuſe of ſwearing. It is unqueſtionably impious to call upon God to witneſs impertinences, or to uſe his tremendous name as a mere *expletive* in converſation; but it by no means follows, that we may not piouſly call upon him to witneſs truths of importance, or invoke his name with reverence and ſolemnity. No individual could, without groſs profaneneſs, pray for a thouſand times more wealth than he may ever have occaſion to uſe; but it is never thought profane to pray "day by day for our daily bread, for rain from heaven, and fruitful ſeaſons." If it be lawful to aſk of God theſe earthly [illegible] becauſe he alone can beſtow them; it cannot ſurely be unlawful, where the lives or properties of our neighbours, or the ſecurity of government is concerned, to invoke him with reverence to witneſs the truth of our aſſertions, or the ſincerity of our intentions; becauſe of our truth in many caſes, and of our ſincerity in all, none but he can be the witneſs.

The text of Scripture upon which the Quakers chiefly reſt their argument for the unlawfulneſs of all ſwearing under the Goſpel, is our Saviour's prohibi-

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(a) The word *oath* is a corruption of the Saxon *eoth*. It is often in England called a *corporal oath*, becauſe, in the days of popery, the perſon was ſworn over the hoſt or *corpus Chriſti*.

(b) The various oaths required by different nations at different times, and the various forms, &c. of impoſing them, is a ſubject of very conſiderable extent and curioſity: An account of them does not fall within the plan of the preſent article; it would indeed extend it to an undue length: we cannot, however, omit obſerving, what is doubtleſs very remarkable, that the grand impoſtor Mahomet taught the Moſlems, that their oaths might be diſſolved. This wonderful doctrine is contained in the 66th chapter of the Koran; which, to free himſelf from his promiſe and oath to Hafsa his ſpouſe, he pretended was revealed. What the uſe of oaths is in ſuch circumſtances, or what ſecurity they afford for performance, it is difficult to aſcertain.

It is alſo very remarkable, that an oath reſpecting marriages was the cauſe of the firſt divorce at Rome. The circumſtance happened about the year of the city 525, Poſthumius Albinus and Spurius Carvilius being conſuls. The cenſors of this year obſerving the population declining, and imagining it proceeded from intereſted marriages and promiſcuous cohabitation, obliged all the citizens to ſwear, that they would not marry with any other view than that of peopling the republic. It raiſed, however, many ſcruples, and occaſioned many domeſtic ruptures. Among the reſt, one Carvilius Ruga, a man of diſtinction, imagined that he was bound by his oath to divorce his wife, whom he paſſionately loved, becauſe ſhe was barren, which was the firſt inſtance of a divorce at Rome from its foundation, though the marriage laws of the kings allowed it; it afterwards, however, became ſhamefully frequent. This is alſo a ſtriking inſtance of the great attention paid to oaths among the Romans: it is remarked indeed by all writers, that they paid a moſt profound reſpect to them; and on that we know they founded their hopes of ſucceſs in war.

tion (Mat. v. 34.): "I ſay into you, ſwear not at all." But whoever ſhall take the trouble of turning over his Bible, and looking at the context, will perceive, that it is only in *ordinary converſation*, and by no means in courts of juſtice, that our Lord prohibits his followers from ſwearing at all. There is no evidence whatever, that ſwearing by *heaven*, by *the earth*, by *Jeruſalem*, or by their own *heads*, was the form of a *judicial oath* in uſe among the Jews. On the contrary, we are told by *Maimonides**, that "if any man ſwear by heaven or by earth, yet this is not an oath;" which ſurely he could not have ſaid, had ſuch been the forms of judicial ſwearing. Indeed they could not have admitted ſuch forms into their courts without expreſsly violating the law of Moſes, who commands them to "Fear the Lord (JEHOVAH) their God, to ſerve him, and to ſwear by his NAME." But the Jews, as every one knows, had ſuch a reverence for the name *Jehovah*, that they would not pronounce it on ſlight occaſions, and therefore could not ſwear by that name in common converſation. Hence, to gratify their propenſity to common ſwearing, they invented ſuch oaths as, by *heaven*, by *earth*, by *Jeruſalem*, by *the life of thy head*, &c. and by this contrivance they thought to avoid the guilt of profaning the name JEHOVAH. Theſe, however, being appeals to inſenſible objects, either had no meaning, or were in fact, as our Saviour juſtly argues, oaths by that God whoſe creatures they were; ſo that the Jew who ſwore them was ſtill guilty of profaneneſs towards the very JEHOVAH whoſe name his ſuperſtition would not permit him to pronounce. But what puts it beyond all doubt that the uſe of judicial oaths is not wholly prohibited in the goſpel, is the conduct of our Saviour himſelf as well as of his apoſtle St Paul. When Jeſus was ſimply *aſked* by the high prieſt, what it was which certain falſe witneſſes teſtified againſt him? we are told by the evangeliſts, that "he held his peace:" but being *adjured* by the living God to declare whether he was the Chriſt, the Son of God, or not, he immediately anſwered the high prieſt, without objecting to the *oath* (for ſuch it was) upon which he was examined. "St Paul, in his Epiſtle to the Romans†, ſays, '*God is my witneſs*, that, without ceaſing, I make mention of you in my prayers;' and to the Corinthians, ſtill more ſtrongly, '*I call God for a record upon my ſoul*, that, to ſpare you, I came not as yet to *Corinth*.' Both theſe expreſſions are of the nature of oaths; and the author of the Epiſtle to the Hebrews ſpeaks of the cuſtom of ſwearing judicially without any mark of cenſure or diſapprobation; 'Men verily ſwear by the greater; and an oath, for confirmation, is to them an end of all ſtrife.'"

But though a nation has an undoubted right to require the ſecurity of an oath upon occaſions of r importance, we do not heſitate to ſay, that, in our opinion, it is ſomething worſe than bad policy to multiply oaths, and to hold out to the people temptations to perjure themſelves. The ſecurity which an oath affords, depends entirely upon the reverence which attaches to it in the mind of him by whom it is given; but that reverence is much weakened by the frequency of oaths, and by the careleſs manner in which they are too often adminiſtered. An excellent moraliſt ‡ obſerves, with truth, that "the levity and frequency with which oaths are adminiſtered, has brought about a general inadvertency to the obligation of them, which both in a religious and political view is much to be lamented; and it merits (continues he) public conſideration, whether the requiring of oaths on ſo many frivolous occaſions, eſpecially in the cuſtoms, and in the qualification for petty offices, has any other effect than to make them cheap in the minds of the people. A pound of tea cannot travel regularly from the ſhip to the conſumer without coſting *half a dozen oaths* at leaſt; and the ſame ſecurity for the due diſcharge of his office, namely that of an oath, is required from a *church warden* and an *archbiſhop*, from a [illegible] *conſtable* and the *chief juſtice* of England. Let the [illegible] continue its own ſanctions, if they be thought requiſite; but let it ſpare the ſolemnity of an [illegible] and where it is neceſſary, from the want of ſomething better to depend upon, to accept a man's own word or own account, let it annex to prevarication penalties proportioned to the public conſequence of the offence."

That theſe pernicious conſequences of frequent oaths are not felt only in England, we have the evidence of another reſpectable writer, whoſe acuteneſs well qualified him to obſerve, whilſt his ſtation in ſociety furniſhed him with the beſt opportunities of obſerving, the effects of repeated ſwearing upon the morals of Scotchmen. "Cuſtomhouſe oaths (ſays Lord Kames*) have become ſo familiar among us, as to be ſwallowed without a wry face; and it is certain that bribery and perjury in electing parliment members are not approaching to the ſame cool ſtate? Men creep on to vice by degrees. Perjury, in order to ſupport a friend, has become cuſtomary of late years; witneſs fictitious qualifications in the electors of parliament-men, which are made effectual by perjury: yet ſuch is the degeneracy of the preſent times (c), that no man is the worſe thought of upon that account. We muſt not flatter ourſelves, that the poiſon will reach no farther: a man who boggles not at perjury to ſerve a friend, will in time become ſuch an adept, as to commit perjury in order to ruin a friend when he becomes an enemy."

Beſides the frequency of oaths, we have mentioned the irreverent manner in which they are too often adminiſtered as one of the cauſes which make them cheap in the eſtimation of the people. In this view, the *form* of the oath, and the *ceremonies* with which it is required to be taken, are of conſiderable importance. "The

* See *Whitby on the Place.*

† *Paley's Moral Philoſophy.*

‡ *Mr Paley.*

* *Sketches of the Hiſtory of Man.*

(c) Such was the caſe when his Lordſhip wrote. Some deciſions of the houſe of peers, however, have ſince that period changed men's opinions reſpecting the legality of theſe votes and the innocence of the means by which they were made effectual. It is to be hoped that ſuch a reformation will ſoon be made of the laws by which elections are regulated in Scotland, as will render the temptations to perjury leſs numerous than they have hitherto been.

" The forms of oaths in Chriſtian countries (ſays Mr Paley) are very different; but in none I believe worſe contrived either to convey the meaning or to impreſs the obligation of an oath, than in England. In that country the juror, after repeating the promiſe or affirmation which the oath is intended to confirm, adds, 'ſo help me God;' or more frequently the ſubſtance of the oath is repeated to the juror by the officer or magiſtrate who adminiſters it; adding in the concluſion, 'ſo help you God.' The energy of the ſentence reſides in the particle *ſo; ſo*, i. e. *hac lege*, 'upon condition of my ſpeaking the truth, or performing this promiſe, may God help me, and not otherwiſe.' The juror, whilſt he hears or repeats the words of the oath, holds his right hand upon a Bible, or other book containing the four goſpels. 'The concluſion of the oath ſometimes runs, '*ita me Deus adjuvet, et hac ſancta evangelia*,' or 'ſo help me God, and the contents of this book;' which laſt clauſe forms a connexion between the words and action of the juror, which before was wanting. The juror [illegible] kiſſes the book."

This obſcure and elliptical form, [illegible] author juſtly obſerves, is ill calculated [illegible] the juror with reverence: and he ſeems [illegible] great preference due to the form of judicial oaths [illegible] Scotland. In that country the juror holds up [illegible] right hand towards heaven, and ſwears by Almighty God, and as he ſhall anſwer to God at the great day of judgment, "that he will tell the truth, the whole truth, and nothing but the truth, ſo far as he knows, or it ſhall be aſked of him." This, if adminiſtered with dignity and reverence, is an oath ſufficiently ſolemn and well calculated to have the proper effect upon the mind of the juror, as it brings immediately into his view the Author of his being, and the awful day of final retribution when every man ſhall receive the things done in his body according to that he hath done, whether it be good or evil. But when the magiſtrate, as is too often the caſe, repeats this ſolemn invocation without riſing from his ſeat at the name of the ſupreme Being, and in a tone of careleſſneſs which may convey to the ignorant juror an opinion that he has himſelf no ſerious belief that there ever will be a great day of judgment, the form, however excellent, makes not its full impreſſion.

But let us ſuppoſe the oath to be adminiſtered with the greateſt dignity and reverence, the words of the promiſe itſelf appear to us by no means unexceptionable. In a trial on life and death, we ſhould be glad to know wh. this oath binds the witneſs to declare. Is he to tell *all that he knows* touching the matter in queſtion? or only all that ſhall be *aſked* of him? If he be obliged, in virtue of his oath, to tell all that he knows, the clauſe—"or it ſhall be aſked of you" is ſuperfluous, and calculated to miſlead. If he be bound to tell nothing more of the truth than what ſhall be aſked of him, the word *or* ſhould be changed into *and;* he ſhould ſwear "to tell the truth, &c. ſo for as he knows, *and* it ſhall be aſked of him." The court, we believe, conſiders the witneſs as bound to declare every thing which he knows touching the matter in queſtion. The greater part of witneſſes, on the other hand, conſider themſelves as bound no farther by their oath than to give true anſwers to ſuch queſtions as ſhall be aſked of them. They would do well, however, to remember, that as oaths are deſigned for the ſecurity of the *public*, they muſt be interpreted in the ſenſe in which the public intends them, otherwiſe they afford no ſecurity. But the ſenſe of the public is the law; and as it belongs to the court to declare what the mind of the law is, the witneſs, who has any doubt concerning the extent of the obligation impoſed on him by the words of this oath, ſhould apply to the court for a ſolution of that doubt, which will be a ſafe guide to him reſpecting the evidence which he is to give. Should the court, in reſolving the doubts of a witneſs, give an opinion concerning the ſenſe of any other part of the oath contrary to what he apprehends to be the deſign of the law in impoſing it, he is bound to diſregard ſuch opinion; becauſe it is only when [illegible] himſelf is doubtful that the court has a right to interfere, and becauſe in all moral queſtions men muſt [illegible]ally determined by their own judgment and conſcience.

There is one caſe, and but one, in which, whatever ſenſe be put upon the words of the oath, no witneſs is obliged to declare the *whole* truth. It is when ſuch declaration would tend to accuſe himſelf of ſome legal crime; for as the laws of Scotland and England conſtrain no man to become his own accuſer, they muſt be conſidered as impoſing the oath of teſtimony with this tacit reſervation. "The exception, however †, muſt be confined to *legal* crimes. A point [illegible]nour, of delicacy, or of reputation, may make a witneſs backward to diſcloſe ſome circumſtance with which he is acquainted; but is no excuſe for concealment, unleſs it could be ſhown, that the law which impoſes the oath, intended to allow this indulgence to ſuch motives. The exception is alſo withdrawn by compact between the magiſtrate and the witneſs, when an accomplice is admitted to give evidence againſt the partners of his crime." But theſe are a ſort of witneſſes to whom a ſenſible jury will always liſten with a very cautious ear.

Oaths are either *aſſertory* or *promiſſory*. Aſſertory oaths are required both to confirm our veracity in evidence, and to give ſecurity to the public that we *believe* certain propoſitions conceived to be of public importance. An oath in *evidence* binds the juror to declare what he *knows* to be true, and nothing *but* what he knows to be true. An oath required to aſſure the public of our *belief* in the *truth* of any propoſition, cannot, without the guilt of perjury, be taken by any man, who, at the time of ſwearing, has the ſlighteſt doubt whether the propoſition be really true. Such an oath, however, though it unqueſtionably requires the ſincerity of the juror's belief at the time when it is given cannot oblige him to continue in that belief as long as he may live; for belief is not in any man's power: it is the neceſſary conſequence of evidence, which *compels* the aſſent of the mind according as it appears to preponderate on the one ſide or on the other. No man, therefore, can be juſtly accuſed of perjury for holding opinions contrary to thoſe which he may formerly have ſworn to believe; becauſe his belief at the time of emitting his oath may have been the neceſſary reſult of the evidence which then appeared before him; and his change of opinion may have reſulted with the ſame neceſſity from ſuperior

† *Paley's Moral Philoſophy.*

evidence which had been ſince thrown into the oppoſite ſcale, and made it preponderate. On this account, we cannot help thinking, that all aſſertory oaths, except ſuch as are neceſſary to confirm teſtimony reſpecting *facts*, ought either to be aboliſhed or expreſſed with great caution. Of truths intuitively certain or capable of rigid demonſtration, no man of common ſenſe can entertain a doubt; and therefore the public never requires from individuals the ſolemnity of an oath as an aſſurance of their believing ſuch truths. But with reſpect to the truth of propoſitions which admit of nothing ſuperior to moral evidence on either ſide, a man of the moſt ſteady virtue may think differently at different periods of his life; and in ſuch caſes, the effect of an oath, if it have any effect, can only be either to ſhut the man's eyes againſt the light, or to make his integrity be cauſeleſsly queſtioned by thoſe who ſhall obſerve his change of belief.

Promiſſory oaths cannot, without the guilt of perjury, be given by him, who, at the time of ſwearing, knows that it will not be in his power to fulfil the promiſe, or who does not ſeriouſly intend to fulfil it. A promiſſory oath cannot, without great guilt, be given by any man, who at the time of ſwearing believes the object of the promiſe to be in itſelf unlawful; for if he ſeriouſly mean to fulfil his oath, he calls upon Almighty God to witneſs his intention to commit a crime. Promiſſory oaths give to the public greater ſecurity than a ſimple promiſe; becauſe the juror having the thoughts of God and of religion more upon his mind at the one time than at the other, offends with a higher hand, and in more open contempt of the divine power, knowledge, and juſtice, when he violates an oath, than when he breaks a promiſe. Yet it is certain that promiſſory oaths, though more ſolemn and ſacred, cannot be binding, when the promiſe without an oath would not be ſo in an inferior degree; for the ſeveral caſes of which, ſee Promise and Allegiance.

Coronation Oath. See King.

OATHLAW, the name of a pariſh in Angus, about two miles from Forfar, chiefly remarkable for the remains of a Roman camp called *Battle-dykes* (vulgarly *Black-dykes*), which is about a mile weſt of the church.

OBADIAH, or the *Prophecy of* Obadiah, a canonical book of the Old Teſtament, which is contained in one ſingle chapter; and is partly an invective againſt the cruelty of the Edomites, who mocked and derided the children of Iſrael as they paſſed into captivity; and with other enemies, their confederates, invaded and oppreſſed thoſe ſtrangers, and divided the ſpoil among themſelves; and partly a prediction of the [illegible] of Iſrael, and of the victory and triumph of the [illegible] church over her enemies.

Obadiah, the prophet, is believed to have been the ſame with the governor of Ahab's houſe, mentioned in the firſt book of Kings, (xviii. 3, &c.) who hid and fed the hundred prophets whom Jezebel would have deſtroyed; and ſome ſay, that he was that Obadiah whom Joſiah made overſeer of the works of the temple, (2 Chron. xxxiv. 12.) The truth is, that when he lived or propheſied is wholly uncertain: though moſt writers make him cotemporary with Hoſea, Amos, and Joel.

Obadiah, a valiant man of David's army, who came to join him in the wilderneſs, with ſeveral others of the tribe of Gad, (1 Chron. xii. 9.)

This was alſo the name of one of thoſe whom King Jehoſhaphat ſent into the cities of Judah to inſtruct the people in their religion, (2 Chron. xvii. 7.) It was alſo the name of one of the principal men of Judah, who ſigned the covenant that Nehemiah renewed with the Lord, (Nehem. x. 5.)

OBED-EDOM, ſon of Jeduthun, a Levite, (1 Chr. xvi. 38.) and father of Shemaiah, Jehozabad, Joah, Sacar, Nathaneel, Ammiel, Iſſachar, and Peulthai. He had a numerous family, ſays the Scripture, (1 Chr. xxvi. 4.) becauſe the Lord bleſſed him; and this is the occaſion of the bleſſing. When David transferred the ark of the covenant to the city of Jeruſalem, Uzzah having raſhly laid hands on the ark, which he thought to be in danger of falling, was ſmitten of God, and died upon the ſpot. David, terrified at this [illegible] remove the ark into the place he [illegible] in his own houſe, but ſet it up in [illegible] edom, which was near the place [illegible] been ſtruck dead. But the preſence [illegible] only created no temporal misfortune to [illegible] of this Levite, but on the contrary the [illegible] d upon him all ſorts of bleſſings; which [illegible] ed David ſome months after to remove it to the place he had appointed for it. Afterwards Obed-edom and his ſons were aſſigned to be keepers of the doors of the temple, (1 Chron. xv. 18, 21.) In the ſecond book of Samuel, (vi. 10.) Obed-edom is called the Gittite, probably becauſe he was of Gathrimmon, a city of the Levites beyond Jordan, (Joſh. xxi. 24, 25.)

OBELISK, in architecture, a truncated, quadrangular, and ſlender pyramid, raiſed as an ornament, and frequently charged either with inſcriptions or hieroglyphics.

Obeliſks appear to be of very great antiquity, and to have been firſt raiſed to tranſmit to poſterity precepts of philoſophy, which were cut in hieroglyphical characters: afterwards they were uſed to immortalize the great actions of heroes, and the memory of perſons beloved. The firſt obeliſk mentioned in hiſtory was that of Ramaſes king of Egypt, in the time of the Trojan war, which was 40 cubits high. Phius, another king of Egypt, raiſed o[illegible] of 55 cubits; and Ptolemy Philadelphus, anoth[illegible] 88 cubits, in [illegible] ſinoë. Auguſtus erected [illegible] at Rome in th[illegible] which ſerved to [illegible] the hours on a horizontal dial, drawn on th[illegible]. They were called by the [illegible] s *of the ſun*, becauſe they [illegible] as ſtyles or gnomons [illegible] ſtill call them *Pharaoh's needles*; whence th[illegible] them *eguglia*, and the French *aiguilles*.

The famous obeliſks called the *devil's arrows*, now reduced to three, the fourth having been taken down in the laſt century, ſtand about half a mile from the town of Borough-Bridge to the ſouth-weſt, in three fields, ſeparated by a lane, 200 feet aſunder, nearly on high ground ſloping every way. Mr Drake urges many arguments for their Roman antiquity, and plainly proves them to be natural and brought from Hampton quarries about five miles off, or from Ickly 16 miles off. The croſs in the town, 12 feet high, is of the ſame kind of ſtone. The eaſtermoſt or higheſt is 22 feet and a half high by 4 broad, and 14¼ in girth; the ſecond 21½ by 55½; the third 16½ by 84. Stukeley's meaſures differ. The flutings are cut in the ſtone but not through: the talleſt ſtands alone, and leans to the ſouth. Plot and Stukeley affirm them to be Britiſh monuments, originally hewn ſquare. Dr Gale ſuppoſed that they were Mercuries, which have loſt their heads and inſcriptions; but in a MS note in his Antoninus, he acknowledges that he was miſinformed and that there was no cavity to receive a buſt.

On the north ſide of Penrith, in the churchyard, are two ſquare obeliſks, of a ſingle ſtone each, 11 or 12 feet high, about 12 inches diameter, and 12 by 8 at the ſides, the higheſt about 18 inches diameter, with ſomething like a tranſverſe piece [illegible] into a round baſe. They are 14 [illegible] tween them is a grave encloſed [illegible] ſemicircular ſtones of the unequal lengths of ſix, and four and a half, and two feet high, [illegible] on the outſides rude carving, and the tops notched. This is called the *Giant's grave*, and aſcribed to Sir Ewan Ceſarius, who is ſaid to have been as tall as one of the columns, and capable of ſtretching his arms from one to the other; to have deſtroyed robbers, and wild boars in Englewood foreſt; and to have had an hermitage hereabouts called *Sir Hugh's parlour*; but the conjectures reſpecting them are ſo various and contradictory, that our readers will readily excuſe our enlarging on them.

A little to the weſt of theſe is a ſtone called the *Giant's Thumb*, ſix feet high, 14 inches at the baſe contracted to 10, which is no more than a rude croſs, ſuch as is at Langtown in Cumberland and elſewhere; the circle of the croſs 18 inches diameter.

M. Pouchard, in the memoirs of the Academy of Inſcriptions, gives a very curious account of ſome celebrated Egyptian obeliſks. We cannot afford room to follow him; but thoſe who wiſh for further information on the ſubject, and who are not poſſeſſed of the original, will find a very good account of them in the Gentleman's Magazine for June 1748.

OBJECT, in philoſophy, ſomething apprehended or preſented to the mind by ſenſation or imagination. See Metaphysics, Part I. Chap. I. Sect. II.

Object-*Glaſs* of a *Teleſcope*, or *Microſcope*, the glaſs placed at [illegible] the tube which is next the object. See Optics and Microscope.

OBJECTION, ſomething urged to overthrow a poſition, or a difficulty raiſed againſt an allegation or propoſition of a perſon we are diſputing with.

OBJECTIVE, is uſed in the ſchools, in ſpeaking of a thing which exiſts no otherwiſe than as an object known. The exiſtence of ſuch a thing is ſaid to be objective.

OBIT, (Lat.) ſignifies a funeral ſolemnity, or office for the dead, moſt commonly performed when the corpſe lies in the church uninterred: Alſo the anniverſary office. (2 Cro. 51 Dyer 313). The anniverſary of any perſon's death was called the *obit*; and to obſerve ſuch day with prayers and alms, or other commemoration, was the keeping of the obit. In religious houſes they had a regiſter, wherein they entered the obits or obitual days of their founders and benefactors; which was thence termed the *obituary*. The tenure of obit or chantry lands is taken away and extinct by 1 Edward VI. c. 14. and 15 Car. II. c. 9.

OBLATI, in church hiſtory, were ſecular perſons, who devoted themſelves and their eſtates to ſome monaſtery, into which they were admitted as a kind of lay brothers. The form of their admiſſion was putting the bell ropes of the church round their necks, as a mark of ſervitude. They wore a religious habit, but different from that of the monks.

OBLIGATION, in general, denotes any act whereby a perſon becomes bound to another to do ſomething; as to pay a ſum of money, be ſurety, or the like.

Obligations are of three kinds, *viz.* natural, civil, and mixed. Natural obligations are entirely founded on natural equity; civil obligation on civil authority alone, without any foundation in natural equity; and mixed obligations are thoſe which, being founded on natural equity, are farther enforced by civil authority.

In a legal ſenſe, obligation ſignifies a bond, wherein is contained a penalty, with a condition annexed for the payment of money, &c. The difference between it and a bill is, that the latter is generally without a penalty or condition, though it may be made obligatory; and obligations are ſometimes by matter of record, as ſtatutes and recognizances. See the article Bond.

Moral Obligation. See Moral Philosophy, N° 58, &c.

OBLIQUE, in geometry, ſomething aſlant, or that deviates from the perpendicular. Thus an oblique angle is either an acute or obtuſe one, *i. e.* any angle except a right one.

Oblique Caſes, in grammar, are all the caſes except the nominative. See Grammar.

Oblique Line, that which, falling on another line, makes oblique angles with it, *viz.* one acute, and the other obtuſe.

Oblique Planes, in dialling, are thoſe which decline from the zenith, or incline towards the horizon. See Dial.

Oblique Sailing, in navigation, is when a ſhip ſails upon ſome rhumb between the four cardinal points, making an oblique angle with the meridian; in which caſe ſhe continually changes both latitude and longitude. See Navigation, Chap. VIII.

OBLIQUUS, in anatomy, a name given to ſeveral muſcles, particularly in the head, eyes, and abdomen. See Anatomy, *Table of the Muſcles.*

OBLONG, in general, denotes a figure that is longer than broad; ſuch is a parallelogram.

OBOLARIA, in botany: A genus of the angioſpermia order, belonging to the didynamia claſs of plants; and in the natural method ranking under the 40th order, *Perſonatæ*. The calyx is bifid; the corolla campanulated and quadrifid; the capſule unilocular, bivalved, and polyſpermous; the ſtamina riſing from the diviſions of the corolla.

OBOLUS, an ancient ſilver money of Athens, the ſixth part of a drachma; worth ſomewhat more than a penny-farthing ſterling.—The word comes from the Greek οβολος, or οβελος, "ſpit, or broach;" either becauſe it bore ſuch an impreſſion; or becauſe, according to Euſtathius, it was in form thereof. But thoſe now in the cabinets of the antiquaries are round.

Obolus, in medicine, is uſed for a weight of ten grains, or half a ſcruple.

OBOTH, an encampment of the Hebrews in the wilderneſs. From Punon they went to Oboth, and from Oboth to Ije-abarim, (Numb. xxi. 10. xxxiii. 43.) Ptolemy ſpeaks of a city called Oboda, or Eboda, in Arabia Petræa, which is the ſame as Oboth. Pliny and the geographer Stephanus mention it alſo. Stephanus makes it belong to the Nabathæans, and Pliny to the Helmodeans, a people of Arabia. It was at Oboth that they worſhipped the god Obodos, which Tertullian joins with Duſares, another god or king of this country.

OBRECHT (Ulric), a learned German, born of a noble family at Straſburg in 1646, where he filled the chairs of civil law and hiſtory with great diſtinction. He was of the Proteſtant religion; but when Louis XIV. made himſelf maſter of Straſburg, and went there with his court, he was prevailed on to change; and accordingly abjured in 1684, and put his inſtrument into the hands of Boſſuet biſhop of Meaux. The next year the king nominated him to preſide in his name in the ſenate of Straſburg, with the title of prætor royal, in imitation of the ancient Romans; from which time Mr Obrecht applied himſelf entirely to public affairs. He was the editor, tranſlator, and writer, of ſeveral learned works; and died in 1701.

OBREPTITIOUS, an appellation given to letters patent, or other inſtruments, obtained of a ſuperior by ſurpriſe, or by concealing from him the truth.

OBSCURE, ſomething that is dark and reflects little light in material objects, or that is not clear and intelligible in the objects of the intellect.

OBSECRATION, in rhetoric, a figure whereby the orator implores the aſſiſtance of God or man.

OBSEQUENS (Julius), a Latin writer, conjectured to have lived before the emperor Honorius's reign. He made a collection of the prodigies which Livy related in his hiſtory. There are ſeveral editions of thoſe remains. Lycoſthenes endeavoured to ſupply what was wanting in the original.

OBSEQUIES, the ſame with funeral ſolemnities. See Funeral.

OBSERVATION, among navigators, ſignifies the taking the ſun's or the ſtars meridian altitude, in order thereby to find the latitude.

OBSERVATORY, a place deſtined for obſerving the heavenly bodies; being generally a building erected on ſome eminence, covered with a terrace for making aſtronomical obſervations.

The more celebrated obſervatories are, 1. The Greenwich obſervatory, built in 1676, by order of Charles II. at the ſolicitation of Sir Jonas Moore and Sir Chriſtopher Wren; and furniſhed with the moſt accurate inſtruments; particularly a noble ſextant of ſeven feet radius, with teleſcopic ſights.

2. The Paris obſervatory, built by the order of Louis XIV. in the Fauxbourg St Jacques.

It is a very ſingular, but withal a very magnificent building, the deſign of Monſieur Perault; it is 80 feet high, and at top is a terrace.

The difference in longitude between this and the Greenwich obſervatory is 2° 20′.

In it is a cave or cellar, of 170 feet deſcent, for experiments that are to be made far from the ſun, &c. particularly ſuch as relate to congelations, refrigerations, indurations, conſervations, &c.

3. Tycho Brahe's obſervatory, which was in the little iſland Ween, or Scarlet Iſland, between the coaſts of Schonen and Zealand in the Baltic. It was erected and furniſhed with inſtruments at his own expence, and called by him *Uraniburg*. Here he ſpent twenty years in obſerving the ſtars; the reſult is his catalogue.

4. Pekin obſervatory. Father Le Compte deſcribes a very magnificent obſervatory, erected and furniſhed by the late emperor of China, in his capital, at the interceſſion of ſome Jeſuit miſſionaries, principally Fa- [illegible] whom he made his chief obſerver.—[illegible] exceedingly large; but the divi- [illegible] and the contrivance in ſome reſpects [illegible] than that of the Europeans. The [illegible] An armillary zodiacal ſphere of ſix feet dia- [illegible] quinoctial ſphere of ſix feet diameter; an azimuthal horizon of ſix feet diameter; a large quadrant ſix feet radius; a ſextant eight feet radius; and a celeſtial globe ſix feet diameter.

Obſervatories, as they are very uſeful, and indeed abſolutely neceſſary for aſtronomers, ſo they have become more common than they were. There is a very excellent one now at Oxford, built by the truſtees of Dr Radcliffe, at the expence of nearly 30,000l. At Cambridge there is as yet no public obſervatory. Over the great gate of Trinity college, indeed, there is one which is called *Sir Iſaac Newton's*, becauſe this great philoſopher had uſed it; but it is gone to decay. It were well if the univerſity would repair and preſerve it in memory of that truly great man. In St John's, too, there is a ſmall one. The late ingenious Mr Cotes had uſed to give lectures in Sir Iſaac Newton's on experimental philoſophy. There are ſeveral very good ones in the Scotch univerſities; and there is an excellent one lately erected at Dublin.

Plate CCCXLVIII.

5. Bramins obſervatory at Benares. Of this Sir Robert Barker gives the following account, (Phil. Tranſ. Vol. LXVII. p. 598.) "Benares in the Eaſt Indies, one of the principal ſeminaries of the Bramins or prieſts of the original Gentoos of Hindoſtan, continues ſtill to be the place of reſort of that ſect of people; and there are many public charities, hoſpitals, and pagodas, where ſome thouſands of them now reſide. Having frequently heard that the ancient Bramins had a knowlege of aſtronomy, and being confirmed in this by their information of an approaching eclipſe both of the ſun and moon, I made inquiry, when at that place in the year 1772, among the principal Bramins, to endeavour to get ſome information relative to the manner in which they were acquainted of an approaching eclipſe. The moſt intelligent that I could meet with, however, gave me but little ſatisfaction. I was told, that theſe matters were confined to a few, who were in poſſeſſion of certain books and records; ſome containing the my-

ſteries of their religion; and others the tables of aſtronomical obſervations, written in the Shanſcrit language, which few underſtood but themſelves: that they would take me to a place which had been conſtructed for the purpoſe of making ſuch obſervations as I was inquiring after, and from whence they ſuppoſed the learned Bramins made theirs. I was then conducted to an ancient building of ſtone, the lower part of which, in its preſent ſituation, was converted into a ſtable for horſes, and a receptacle for lumber; but, by the number of court-yards and apartments, it appeared that it muſt once have been an edifice for the uſe of ſome public body of people. We entered this building, and went up a ſtaireaſe to the top of a part of it, near to the river Ganges, that led to a large terrace, where, to my ſurpriſe and ſatisfaction, I ſaw a number of inſtruments yet remaining, in the greateſt preſervation, ſtupendouſly large, immoveable from the ſpot, and built of ſtone, ſome of them being upwards of 20 feet in height; and although they are ſaid to have been erected 200 years ago, the graduated diviſions on the ſeveral arcs appeared as well cut, as accurately divided, as if they had been the performance of a modern artiſt. The execution in the conſtruction of theſe inſtruments exhibited a mathematical exactneſs in the fixing, bearing, fitting of the ſeveral parts, in the neceſſary and ſufficient ſupports to the very large ſtones that compoſed them, and in the joining and faſtening each into the other by means of lead and iron.

"The ſituation of the two large quadrants of the inſtrument marked A in the plate, whoſe radius is nine feet two inches, by their being at right angles with a gnomon at twenty-five degrees elevation, are thrown into ſuch an oblique ſituation as to render them the moſt difficult, not only to conſtruct of ſuch a magnitude, but to ſecure in their poſition for ſo long a period, and affords a ſtriking inſtance of the ability of the architect in their conſtruction: for, by the ſhadow of the gnomon thrown on the quadrants, they do not appear to have altered in the leaſt from their original poſition; and ſo true is the line of the gnomon, that, by applying the eye to a ſmall iron ring of an inch diameter at one end, the ſight is carried through three others of the ſame dimenſion, to the extremity at the other end, diſtant 38 feet 8 inches, without obſtruction; ſuch is the firmneſs and art with which this inſtrument has been executed. This performance is the more wonderful and extraordinary when compared with the works of the artificers of Hindoſtan at this day, who are not under the immediate direction of an European mechanic; but arts appear to have declined equally with ſcience in the eaſt.

"Lieutenant Colonel Archibald Campbell, at that time chief engineer in the Eaſt India Company's ſervice at Bengal, made a perſpective drawing of the whole of the apparatus that could be brought within his eye at one view; but I lament he could not repreſent ſome very large quadrants, whoſe radii were about twenty feet, they being on the ſide from whence he took his drawing. Their deſcription however is, that they are exact quarters of circles of different radii, the largeſt of which I judged to be 20 feet, conſtructed very exactly on the ſides of ſtone walls, built perpendicular, and ſituated, I ſuppoſe, in the meridian of the place: a braſs pin is fixed at the centre or angle of the quadrant, from whence, the Bramin informed me, they ſtretched a wire to the circumference when an obſervation was to be made; from which, it occurred to me, the obſerver muſt have moved his eye up or down the circumference, by means of a ladder or ſome ſuch contrivance, to raiſe and lower himſelf, until he had diſcovered the altitude of any of the heavenly bodies in their paſſage over the meridian, ſo expreſſed on the arcs of theſe quadrants: theſe arcs were very exactly divided into nine large ſections; each of which again into ten, making ninety leſſer diviſions or degrees; and thoſe alſo into twenty, expreſſing three minutes each, of about two-tenths of an inch aſunder; ſo that it is probable they had ſome method of dividing even theſe into more minute diviſions at the time of obſervation.

"My time would only permit me to take down the particular dimenſions of the moſt capital inſtrument, or the greater equinoctial ſun dial, repreſented by figure A, which appears to be an inſtrument to expreſs ſolar time by the ſhadow of a gnomon upon two quadrants, one ſituated to the eaſt, and the other to the weſt of it; and indeed the chief part of their inſtruments at this place appear to be conſtructed for the ſame purpoſe, except the quadrants, and a braſs inſtrument that will be deſcribed hereafter.

"Figure B is another inſtrument for the purpoſe of determining the exact hour of the day by the ſhadow of a gnomon, which ſtands perpendicular to, and in the centre of, a flat circular ſtone, ſupported in an oblique ſituation by means of four upright ſtones and a croſs piece; ſo that the ſhadow of the gnomon, which is a perpendicular iron rod, is thrown upon the diviſion of the circle deſcribed on the face of the flat circular ſtone.

"Figure C is a braſs circle, about two feet diameter, moving vertically upon two pivots between two ſtone pillars, having an index or hand turning round horizontally on the centre of this circle, which is divided into 360 parts; but there are no counter diviſions on the index to ſubdivide thoſe on the circle. This inſtrument appears to be made for taking the angle of a ſtar at ſetting or riſing, or for taking the azimuth or amplitude of the ſun at riſing or ſetting.

"The uſe of the inſtrument, figure D, I was at a loſs to account for. It conſiſts of two circular walls; the outer of which is about forty feet diameter, and eight feet high; the wall within about half that height, and appears intended for a place to ſtand on to obſerve the diviſions on the upper circle of the outer wall, rather than for any other purpoſe; and yet both circles are divided into 360 degrees, each degree being ſubdivided into twenty leſſer diviſions, the ſame as the quadrants. There is a door-way to paſs into the inner circle, and a pillar in the centre, of the ſame height with the lower circle, having a hole in it, being the centre of both circles, and ſeems to be a ſocket for an iron rod to be placed perpendicular into it. The diviſions on theſe, as well as all the other inſtruments, will bear a nice examination with a pair of compaſſes.

"Figure E is a ſmaller equinoctial ſun dial, conſtructed upon the ſame principle as the large one A.

"I cannot quit this ſubject without obſerving, that the Bramins, without the aſſiſtance of optical glaſſes, moſt conſiderable: the Tom falls into it in Lat. 58. and the Irtis in Lat. 61. and Long. 86. The exact courſe of this river was unknown till the country was ſurveyed by the Ruſſians; who have given us tolerable maps of it and of all Siberia. The Oby forms the boundary between Europe and Aſia, and its courſe is upwards of 2000 miles in length.

OCCIDENT, in geography, the weſtward quarter of the horizon; or that part of the horizon where the ecliptic, or the ſun therein, deſcends into the lower hemiſphere; in contradiſtinction to *orient*. Hence we uſe the word *occidental* for any thing belonging to the weſt; as occidental bezoar, occidental pearl, &c.

OCCIPITAL, in anatomy, a term applied to the parts of the occiput, or back part of the ſkull.

OCCULT, ſomething hidden, ſecret, or inviſible. The occult ſciences are magic, necromancy, cabbala, &c. Occult qualities, in philoſophy, were thoſe qualities of body or ſpirit which baffled the inveſtigation of philoſophers, and for which they were unable to give any reaſon; unwilling however to acknowledge their ignorance, they deceived themſelves and the vulgar by an empty title, calling what they did not know *occult*.

OCCULT, in geometry, is uſed for a line that is ſcarce perceivable, drawn with the point of the compaſſes or a leaden pencil. Theſe lines are uſed in ſeveral operations, as the raiſing of plans, deſigns of building, pieces of perſpective, &c. They are to be effaced when the work is finiſhed.

OCCULTATION, in aſtronomy, the time a ſtar or planet is hid from our ſight, by the interpoſition of the body of the moon or ſome other planet.

OCCUPANCY, in law, is the taking poſſeſſion of thoſe things which before belonged to nobody. This is the true ground and foundation of all PROPERTY, or of holding thoſe things in ſeveralty, which by the law of nature, unqualified by that of ſociety, were common to all mankind. But, when once it was agreed that every thing capable of ownerſhip ſhould have an owner, natural reaſon ſuggeſted, that he who could firſt declare his intention of appropriating any thing to his own uſe, and, in conſequence of ſuch his intention, actually took it into poſſeſſion, ſhould thereby gain the abſolute property of it; according to that rule of the law of nations, recognized by the laws of Rome, *Quod nullius eſt, id ratione naturali occupanti conceditur*.

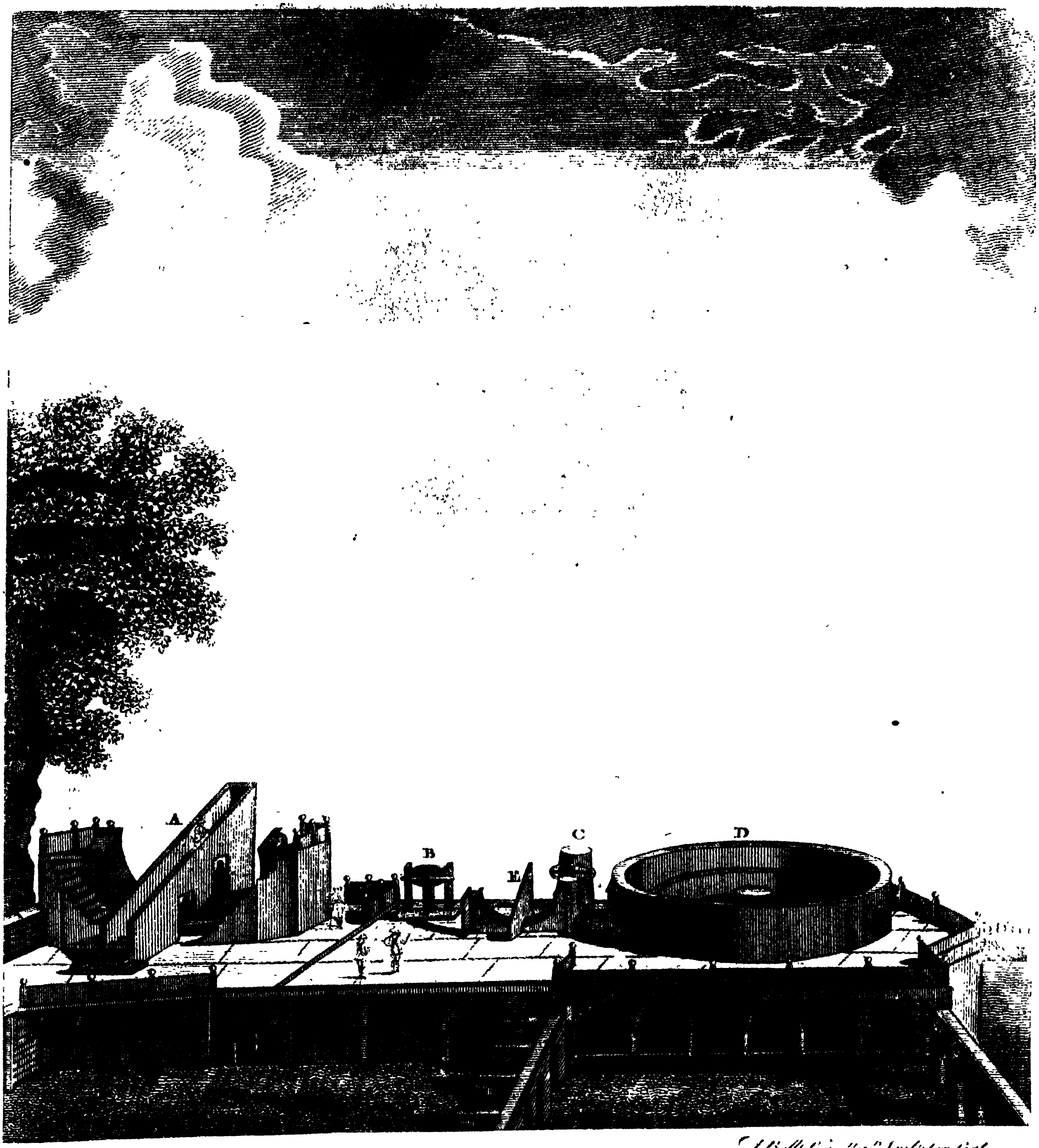
Blackſt. Comment.

This right of occupancy, ſo far as it concerns real property, hath been confined by the laws of England within a very narrow compaſs; and was extended only to a ſingle inſtance; namely, where a man was tenant *pour autre vie*, or had an eſtate granted to himſelf only (without mentioning his heirs) for the life of another man, and died during the life of *ceſtuy que vie*, or him by whoſe life it was holden: in this caſe, he that could firſt enter on the land, might lawfully retain the poſſeſſion ſo long as *ceſtuy que vie* lived, by right of occupancy.

This ſeems to have been recurring to firſt principles, and calling in the law of nature to aſcertain the property of the land, when left without a legal owner. For it did not revert to the granter, who had parted with all his intereſt, ſo long as *ceſtuy que vie* lived; it

did

Bramin's OBSERVATORY. Plate CCCXLVIII



A. Bell Prin. Wal. Sculptor fecit.

did not eſcheat to the lord of the fee ; for all eſcheats muſt be of the abſolute entire fee, and not of any particular eſtate carved out of it, much leſs of ſo minute a remnant as this : it did not belong to the grantee ; for he was dead : it did not deſcend to his heirs ; for there were no words of inheritance in the grant : nor could it veſt in his executors ; for no executors could ſucceed to a freehold. Belonging therefore to nobody, like the *hæreditas jacens* of the Romans, the law left it open to be ſeized and appropriated by the firſt perſon that could enter upon it, during the life of *ceſtuy que vie*, under the name of an occupant. But there was no right of occupancy allowed, where the king had the reverſion of the lands : for the reverſioner hath an equal right with any other man to enter upon the vacant poſſeſſion ; and where the king's title and a ſubject's interfere, the king's ſhall always be preferred. Againſt the king therefore there could be no prior occupant, becauſe *nullum tempus occurrit regi*. And, even in the caſe of a ſubject, had the eſtate *pour autre vie* granted to a man *and his heirs* during the life of *ceſtuy que vie*, there the heir might, and ſtill may, enter and hold poſſeſſion, and is called in law a *ſpecial occupant* ; as having a ſpecial excluſive right, by the terms of the original grant, to enter upon and occupy this *hæreditas jacens*, during the reſidue of the eſtate granted ; though ſome have thought him ſo called with no very great propriety ; and that ſuch eſtate is rather a deſcendible freehold. But the title of *common occupancy* is now reduced almoſt to nothing by two ſtatutes ; the one, 29 Car. II. c. 3. which enacts, that where there is no ſpecial occupant, in whom the eſtate may veſt, the tenant *pour autre vie* may deviſe it by will, or it ſhall go to the executors, and be aſſets in their hands for payment of debts : the other that of 14 Geo. II. c. 20. which enacts, that it ſhall veſt not only in the executors, but, in caſe the tenant dies inteſtate, in the adminiſtrators alſo ; and go in courſe of a diſtribution like a chattel intereſt.

By theſe two ſtatutes the title of *common occupancy* is utterly extinct and aboliſhed : though that of *ſpecial occupancy*, by the heir at law, continues to this day ; ſuch heir being held to ſucceed to the anceſtor's eſtate, not by deſcent, for then he muſt take an eſtate of inheritance, but as an occupant, ſpecially marked out and appointed by the original grant. The doctrine of common occupancy may, however, be uſefully remembered on the following account, amongſt others : That, as by the common law no occupancy could be of incorporeal hereditaments, as of rents, tithes, advowſons, commons, or the like, (becauſe, with reſpect to them, there could be no actual entry made, or corporal ſeiſin had ; and therefore by the death of the grantee *pour autre vie* a grant of ſuch hereditaments was entirely determined) : ſo now, it is apprehended, notwithſtanding thoſe ſtatutes, ſuch grant would be determined likewiſe ; and the hereditaments could not be deviſable, nor veſt in the executors, nor go in a courſe of diſtribution. For the ſtatutes muſt not be conſtrued ſo as to create any new eſtate, or to keep that alive which by the common law was determined, and thereby to defeat the granter's reverſion ; but merely to diſpoſe of an intereſt in being, to which by law there was no owner, and which therefore was left open to the firſt occupant. When there is a reſidue left, the ſtatutes give it to the executors, &c. inſtead of the firſt occupant ; but they will not create a reſidue on purpoſe to give it to the executors. They only mean to provide an appointed inſtead of a caſual, a certain inſtead of an uncertain, owner, of lands which before were nobody's ; and thereby to ſupply this *caſus omiſſus*, and render the diſpoſition of the law in all reſpects entirely uniform ; this being the only inſtance wherein a title to a real eſtate could ever be acquired by occupancy.

For there can be no other caſe deviſed, wherein there is not ſome owner of the land appointed by the law. In the caſe of a ſole corporation, as a parſon of a church, when he dies or reſigns, though there be no *actual* owner of the land till a ſucceſſor be appointed, yet there is a *legal, potential*, ownerſhip, ſubſiſting in contemplation of law ; and when the ſucceſſor is appointed, his appointment ſhall have a retroſpect and relation backwards, ſo as to entitle him to all the profits from the inſtant that the vacancy commenced. And, in all other inſtances, when the tenant dies inteſtate, and no other owner of the lands is to be found in the common courſe of deſcents, there the law veſts an ownerſhip in the king, or in the ſubordinate lord of the fee, by eſcheat.

So alſo, in ſome caſes, where the laws of other nations give a right by occupancy, as in lands newly created, by the riſing of an iſland in a river, or by the alluvion or dereliction of the ſea ; in theſe inſtances, the law of England aſſigns them an immediate owner. For Bracton tells us, that if an iſland ariſe in the *middle* of a *river*, it belongs in common to thoſe who have lands on each ſide thereof ; but if it be nearer to one bank than the other, it belongs only to him who is proprietor of the neareſt ſhore : which is agreeable to, and probably copied from, the civil law. Yet this ſeems only to be reaſonable, where the ſoil of the river is equally divided between the owners of the oppoſite ſhores : for if the whole ſoil is the freehold of any one man, as it muſt be whenever a ſeveral fiſhery is claimed, there it ſeems juſt (and ſo is the uſual practice) that the iſlets, or little iſlands, ariſing in any part of the river, ſhall be the property of him who owneth the piſcary and the ſoil. However, in caſe a new iſland riſe in the *ſea*, though the civil law gives it to the firſt occupant, yet our's gives it to the king. And as to lands gained from the ſea ; either by *alluvion*, by the waſhing up of ſand and earth, ſo as in time to make *terra firma* ; or by *dereliction*, as when the ſea ſhrinks back below the uſual water mark ; in theſe caſes the law is held to be, that if this gain be by little and little, by ſmall and imperceptible degrees, it ſhall go to the owner of the land adjoining. For *de minimis non curat lex* : and, beſides, theſe owners being often loſers by the breaking in of the ſea, or at charges to keep it out, this poſſible gain is therefore a reciprocal conſideration for ſuch poſſible charge or loſs. But if the alluvion or dereliction be ſudden and conſiderable, in this caſe it belongs to the king : for, as the king is lord of the ſea, and ſo owner of the ſoil while it is covered with water, it is but reaſonable he ſhould have the ſoil when the water has left it dry. So that the quantity of ground gained, and the time during which it is gained, are what make it either the king's or the ſubject's property. In the ſame manner, if a river, running between two lordſhips, by degrees gains upon the one, and thereby leaves the other dry; the owner who loſes his ground thus imperceptibly has no remedy: but if the courſe of the river be changed by a ſudden and violent flood, or other haſty means, and thereby a man loſes his ground, he ſhall have what the river has left in any other place as recompenſe for this ſudden loſs. And this law of alluvions and dereliĉtions, with regard to *rivers*, is nearly the ſame in the imperial law; from whence indeed thoſe our determinations ſeem to have been drawn and adopted: but we ourſelves, as iſlanders, have applied them to *marine* increaſes; and have given our ſovereign the prerogative he enjoys, as well upon the particular reaſons before mentioned, as upon this other general ground of prerogative, which was formerly remarked, that whatever hath no other owner is veſted by law in the king. See PREROGATIVE.

OCCUPANT, in law, the perſon that firſt ſeizes or gets poſſeſſion of a thing.

OCCUPATION, in a legal ſenſe, is taken for uſe or tenure: as in deeds it is frequently ſaid, that ſuch lands are, or were lately, in the tenure or occupation of ſuch a perſon.—It is likewiſe uſed for a trade or myſtery.

OCCUPIERS *of* WALLING, a term uſed in the ſaltworks for the perſons who are the ſworn officers that allot in particular places what quantity of ſalt is to be made, that the markets may not be overſtocked, and ſee that all is carried fairly and equally between the lord and the tenant.

OCEAN, that huge maſs of ſalt waters which encompaſſes all parts of the globe, and by means of which, in the preſent improved ſtate of navigation, an eaſy intercourſe ſubſiſts between places the moſt diſtant.

The ocean is diſtinguiſhed into three grand diviſions. 1. The Atlantic ocean, which divides Europe and Africa from America, which is generally about 3000 miles wide. 2. The Pacific ocean, or South ſea, which divides America from Aſia, and is generally about 10,000 miles over. And, 3. The Indian ocean, which ſeparates the Eaſt Indies from Africa: which is 3000 miles over. The other ſeas, which are called *oceans*, are only parts or branches of theſe, and uſually receive their names from the countries they border upon.

For the ſaltneſs, tides, &c. of the ocean, ſee the articles SEA, TIDES, &c.

OCEANIDES (fab. hiſt.), ſea nymphs, daughters of Oceanus, from whom they received their name, and of the goddeſs Tethys or Thetis. They were 3000 according to Apollodorus, who mentions the names of ſeven of them; Aſia, Styx, Eleĉtra, Donis, Eurynome, Amphitrite, and Metis. Heſiod ſpeaks of the eldeſt of them, which he reckons 41, Pitho, Admete, Prynno, Ianthe, Rhodia, Hippo, Callirhoe, Urania, Clymene, Idyia, Paſithoe, Clythia, Zeuxo, Galuxaure, Plexaure, Perſeis, Pluto, Thoe, Polydora, Meloboſis, Dione, Cerceis, Xanthe, Acaſta, Ianira, Teleſtho, Europa, Meneſtho, Petræa, Eudora, Calypſo, Tyche, Ocyroe, Criſia, Amphiro, with thoſe mentioned by Apollodorus, except Amphitrite. Hyginus mentions 16 whoſe names are almoſt all different from thoſe of Apollodorus and Heſiod; which difference proceeds from the mutilation of the original text. The Oceanides, like the reſt of the inferior deities, were honoured with libations and ſacrifices. Prayers were offered to them, and they were entreated to proteĉt ſailors from ſtorms and dangerous tempeſts. The Argonauts, before they proceeded to their expedition, made an offering of flour, honey, and oil, on the ſea ſhore, to all the deities of the ſea, and ſacrificed bulls to them, and entreated their proteĉtion. When the ſacrifice was made on the ſea ſhore, the blood of the viĉtim was received in a veſſel; but when it was in open ſea, they permitted the blood to run down into the waters. When the ſea was calm, they generally offered a lamb or a young pig; but if it was agitated by the winds and rough, a black bull was deemed the moſt acceptable viĉtim.

OCEANUS, in Pagan mythology, the ſon of Cœlus and Terra, the huſband of Thetis, and the father of the rivers and fountains, called *Oceanides*. The ancients called him the *Father of all things*, imagining that he was produced by Humidity, which, according to Thales, was the firſt principle from which every thing was produced. Homer repreſents Juno viſiting him at the remoteſt limits of the earth, and acknowledging him and Thetis as the parents of the gods. He was repreſented with a bull's head, as an emblem of the rage and bellowing of the ocean when agitated by a ſtorm.

According to Homer, he was the father even of all the gods, and on that account he received frequent viſits from them. He is often, indeed almoſt always, repreſented as an old man with a long flowing beard, and ſitting upon the waves of the ſea. He often holds a pike in his hand, while ſhips under ſail appear at a diſtance, or a ſea monſter ſtands near him. Oceanus preſided over every part of the ſea, and even the rivers were ſubjeĉted to his power. The ancients were ſuperſtitious in their worſhip of him, and revered with great ſolemnity a deity to whoſe care they intruſted themſelves when going on any voyage.

OCEIA, a woman who preſided over the ſacred rites of Veſta for 57 years with the greateſt ſanctity. She died in the reign of Tiberius, and the daughter of Domitius ſucceeded her.

OCELLUS *the* LUCANIAN, an ancient Greek philoſopher of the ſchool of Pythagoras, who lived before Plato. His work περι του Παντος, or "The Univerſe," is the only piece of his which is come down entire to, and was written originally in the Doric dialeĉt, but was tranſlated by another hand into the Attic. William Chriſtian, and after him Lewis Nogarola, tranſlated this work into Latin; and we have ſeveral editions of it, both in Greek and Latin.

OCELOT, the Mexican cat. See FELIS.

OCELOXOCHITL, or TYGER-FLOWER, in botany: A large Mexican plant, compoſed of three pointed petals, red, but towards the middle of a mixed white and yellow, repreſenting in ſome degree the ſpots of that wild animal from which it takes its name. The plant has leaves alſo reſembling thoſe of the iris, and a bulbous root. See Plate CCCL.

OCHINUS (Bernardin), a celebrated Italian, was borne at Siene in 1487, and firſt became a Cordelier: but he quickly returned into the world, applied himſelf to the ſtudy of phyſic, and acquired the eſteem of Cardinal Julius de Medicis, afterwards Pope Clement VII. At length, again changing his mind, he reſumed ed his monk's habit in a penitential mood; and not content with this, but aiming at higher perfection, he embraced in 1534 the reformed ſect of the Capuchins. He practiſed, with a moſt rigorous exactneſs, all the rules of the order; which, being then in its infancy, he contributed ſo much to improve and enlarge, that ſome writers have called him the founder of it. He was certainly made vicar-general of it, and became in the higheſt degree eminent for his pulpit eloquence. He delivered his ſermons with ſo much grace and politeneſs, and ſpoke ſo copiouſly, that he raviſhed his audience wherever he was: never indeed was a man more ſucceſsful or more applauded. His extraordinary merit procured him the favour of Pope Paul III. who, it is ſaid, made him his father confeſſor, and preacher. He was thus the darling both of prince and people; when, falling into the company of one John Valde a Spaniard, who had imbibed Luther's doctrine in Germany, he became a proſelyte. He was then at Naples, and began to preach in favour of Proteſtantiſm; which being obſerved, he was ſummoned to appear at Rome; and was in his way thither when he met at Florence Peter Martyr, with whom, it is probable, he had become acquainted at Naples. • This friend perſuaded him not to put himſelf into the pope's power; and they both agreed to withdraw to ſome place of ſafety. Ochinus went firſt to Ferrara, where he diſguiſed himſelf in the dreſs of a ſoldier; and proceeding thence to Geneva, arrived there in 1542, and married a woman of Lucca. He did not, however, ſettle there, but went to Augſburg, where he publiſhed ſome ſer-

In 1547 he was invited, together with Peter Martyr, into England by Archbiſhop Cranmer, that he might have their joint aſſiſtance in carrying on the reformation. They arrived in December; and going to Lambeth, were kindly received by Cranmer. They were entertained there for ſome time; and Ochinus, as well as Martyr, was made a prebendary of Canterbury (A). He laboured heartily in the conduct of the reformation; and his dialogue upon the unjuſt uſurped primacy of the biſhop of Rome, was tranſlated into Latin by Ponet biſhop of Wincheſter, and publiſhed in 1549. But upon the death of Edward VI. being forced as well as Martyr to leave England, they retired to Straſburg, where they arrived in 1553. From this city Ochinus went to Baſil, and was invited thence in 1555 to Zurich, to be miniſter of an Italian church which was gathering there. This church conſiſted of ſome refugees from Locarno, one of the four bailiwicks which the Switzers poſſeſs in Italy; they being hindered from the public exerciſe of the reformed religion by the oppoſition of the Popiſh cantons. Ochinus had no difficulty to ſubſcribe the articles of faith agreed upon by the church of Zurich, and met in that city with Bullinger, who proved a very good friend to him. He governed this Italian church till 1563, when he was baniſhed thence by the magiſtrates of the town for publiſhing ſome dialogues, wherein he defended the doctrine of polygamy. From Zurich he went to Baſil; but not being ſuffered to ſtay there, he fled in great diſtreſs into Moravia, where he fell in with the Socinians, and joined them. Staniſlaus Lubienietſki, the great patron of this ſect, gives the following account of his laſt days in his *Hiſt. Reformat. Polon.* Ochinus, ſays he, retired into Moravia, and into Poland, and even there he was not out of the reach of Calvin's letters. He returned into Moravia after King Sigiſmund's edict; who in 1564 puniſhed with baniſhment all thoſe that were called Tritheiſts, Atheiſts, &c. Some gentlemen endeavoured to keep him in Poland; but he anſwered, that men muſt obey the magiſtrates, and that he would obey them, even were he to die among the wolves in the woods. During his travels, he fell ſick of the plague at Pinckſow, and received there all poſſible offices of kindneſs from one of the brethren, named Philippovius. His daughter and two ſons, whom he carried along with him, died of the plague; but he had buried his wife before he had left Zurich. As for himſelf, he continued his journey to Moravia, and within three weeks died at Slakow, in 1564, aged 77.

His character is various]y repreſented by different authors, as was to be expected; for men like him have all manner of things, good and bad, ſaid and written of them, by ſomebody or other. Bayle ſays, that the confeſſion he made publicly, on the change of his religion, is remarkable. He acknowledged, in a preface, that if he could have continued, without danger of his life, to preach the truth, after the manner he had preached it for ſome years, he would never have laid down the habit of his order; but as he did not find himſelf that courage which is requiſite to undergo martyrdom, he took ſanctuary in a Proteſtant country. His writings are numerous but not bulky.

OCHLOCRACY, that form of government wherein the populace have the chief adminiſtration of affairs.

OCHNA, in botany: A genus of the *monogynia* order, belonging to the polyandria claſs of plants; and in the natural method ranking with thoſe of which the order is doubtful. The corolla is pentapetalous; the calyx pentaphyllous; the berries monoſpermous, and affixed to a large roundiſh receptacle.

OCHRE, in natural hiſtory, a genus of earths, ſlightly coherent, and compoſed of fine, ſmooth, ſoft, argillaceous particles, rough to the touch, and readily diffuſible in water. Ochres are of various colours, as red, blue, yellow, brown, green, &c.

OCHROMA, in botany: A genus of the pentandria order, belonging to the monodelphia claſs of plants; and in the natural method ranking under the 37th order, *Columniferæ*. The corolla conſiſts of ſix petals, three of which are external, and the other three internal; the antheræ unite and form a ſpiral pillar round the ſtyle; the capſule is long, and has five loculaments, and contains a number of black round ſeeds. Of this there is only one ſpecies, viz. the ochroma lagopus, the downtree or corkwood. This tree is frequent in Jamaica, is of ſpeedy growth, and riſes to about 25 or 30 feet. The flowers are large and yellow. The capſules are about five inches long, round-

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(A) According to Wood, Athen. Oxon. but it reſts ſolely on his authority, ſo far as we know.

ed, and covered with a thin ſkin; which when dry falls off in five longitudinal ſegments, and leaves the fruit greatly reſembling a hare's foot. The down is ſhort, ſoft, and ſilky: it is uſed ſometimes to ſtuff beds and pillows; but, like other vegetable downs, is apt to get into clots: an inſipid clear gum exudes from the tree when wounded. The bark is tough, and its fibres are in a reticulated form: it might be made into ropes. The dried wood is ſo very light and buoyant, as to be uſed by the fiſhermen in Jamaica for their nets inſtead of pieces of cork.

OCHUS, a king of Perſia, ſon of Artaxerxes. He was cruel and avaricious; and in order to ſtrengthen himſelf on his throne, he murdered all his brothers and ſiſters. His ſubjects revolted; but he reduced them to obedience, and added Egypt to his other dominions. Bagoas his favourite eunuch poiſoned him for the inſults he had offered to Apis the god of the Egyptians; and he gave his fleſh to be eaten by cats, and made handles for knives with his bones. It ſeems to be not a little remarkable, that all thoſe monſters who diſgraced humanity by their crimes, and ſunk themſelves below the level of brutes, have met with condign puniſhment; and this in general ſeems true, whether we refer to ancient or modern times.—A man of Cyzicus, who was killed by the Argonauts.—A prince of Perſia, who refuſed to viſit his native country for fear of giving all the women each a piece of gold.—A river of India or of Bactriana.—A king of Perſia: He exchanged this name for that of Darius Nothus. See Perſia.

OCKHAM, Occam, or Occham (William of), was a celebrated ſcholaſtic divine in the 14th century, of the order of Cordeliers. He was a native of England, and diſciple to the famous Duns Scotus. He was head of the Nominaliſts: and acquired ſo much celebrity, as to be denominated the *Invincible Doctor*.

At the requeſt of Michael de Ceſena, general of his order, he became a party man with Lewis of Raviere, who was an avowed enemy of the church of Rome; and he really wrote vigorouſly againſt Pope John XXII. and his ſucceſſors. Trithemius informs us, that he uſed to ſay to Lewis, "My Lord, let your ſword defend me, and my pen ſhall be always ready to ſupport you." He treated Charles and Clement in a book he wrote againſt them with a groſs ſcurrility.

This, however, was a bold, dangerous, and imprudent ſtep, and cannot well be defended on any proper principle. The effect of it, as might be expected, was an accuſation againſt him and Ceſena. They were charged with maintaining, that neither Chriſt nor his apoſtles had any poſſeſſions at all, either in common or as private property. This doctrine gave riſe to that pleaſant queſtion called the *bread of the Cordeliers;* and conſiſted in determining, whether the dominion of things conſumed in the uſe, ſuch as bread and wine, belonged to them, or only the ſimple uſe of them, without the dominion? Their rule not permitting them to have any thing as property, Pope Nicolas III. who had been of their order, deviſed a method to enrich them, without breaking their rule. To this end he made an ordinance, that they ſhould have only the uſufruct of the eſtates which ſhould be given to them, and that the ſoil and fund of all ſuch donations ſhould belong to the Roman church at large. By this means he gave them the poſſeſſion of an almoſt infinite number of eſtates, in the name of the church of Rome: but on this account, Pope Nicolas's bull was revoked by John XXII. who condemned the uſe without the dominion, by his *Extravaganta ad Conditorem.* He alſo condemned, by another *Extravaganta cum inter*, the doctrine about the poſſeſſion of eſtates by Chriſt and his apoſtles. Ockham and Ceſena were alſo excommunicated, becauſe they had departed from Avignon without the pope's licenſe, and had written againſt him. Ockham, however, was abſolved, as is ſaid, from this cenſure before he died, which was about the year 1347.

We have ſeveral pieces of his, which are written with conſiderable wit and ſubtility. The reformed church ſometimes makes uſe of his reaſoning againſt the church of Rome. Melchior Goldaſt printed, in his treatiſe upon monarchy, 415 queſtions of Ockham. His works are mentioned by many authors.

OCKLEY (Simon), a learned orientaliſt, was born at Exeter in 1678, and educated at Queen's college, Cambridge, where he diſtinguiſhed himſelf by his intenſe application to literature. At the uſual time he took the degrees in arts, and that of bachelor in divinity; but marrying very young, was precluded from a fellowſhip in his college, and this occaſioned his being afterwards involved in many difficulties. In 1705, he was preſented to the vicarage of Swaveſey in Cambridgeſhire; and in 1711 he was choſen Arabic profeſſor of the univerſity. He was perfect maſter of the Arabic and other oriental tongues: the learned Reland ſaid of him. Vir, ſi quis alius harum literarum peritus." Afterwards, however, he had the misfortune to be confined for ſome time in Cambridge caſtle for debt. The above preferments, notwithſtanding, he enjoyed till his death, which happened on the 9th of Auguſt 1720. He wrote, 1. *Introductio ad Linguas Orientales*. 2. The hiſtory of the preſent Jews throughout the world; tranſlated from the Italian of Leo Modena, a Venetian rabbi. 3. The improvement of human reaſon, exhibited in the life of Hai Ebn Yokdhan, tranſlated from the Arabic. 4. An account of South-weſt Barbary, containing what is moſt remarkable in the kingdoms of Fez and Morocco; written by a perſon who had been a ſlave there a conſiderable time, and tranſlated from his manuſcript. 5. The hiſtory of the Saracens, collected from the moſt authentic Arabic authors, in 2 vols. 8vo. He was not only well ſkilled in the learned languages, but alſo in the modern, as French, Spaniſh, Italian, &c.

OCRA, a viſcous vegetable ſubſtance well known in the Weſt Indies, where it is uſed to thicken ſoup, and for other purpoſes.

OCRISIA (fab. hiſt.), the wife of Corniculus, was one of the attendants of Tanaquil the wife of Tarquinius Priſcus. As ſhe was throwing into the flames for offerings ſome of the meats that were ſerved on the table of Tarquin, ſhe ſuddenly ſaw, as is reported, in the fire what Ovid calls *obſcæni forma virilis*. She informed the queen of it; and when by her command ſhe had approached near it, ſhe conceived a ſon who was named Servius Tullius, and was educated in the king's family. He afterwards ſucceeded to the vacant throne. Some ſuppoſe that Vulcan had aſſumed that form which was preſented to the eyes of Ocriſia, and that this god was the father of the ſixth king of Rome.

OCTAETERIS, a cycle or term of eight years, in the Grecian chronology, at the concluſion of which three entire lunar months were added. This cycle was in uſe till Meton's invention of the golden number or cycle of 19 years.

OCTAGON, or Octogon, in geometry, is a figure of eight ſides and angles; and this, when all the ſides and angles are equal, is called a *regular octagon*, or one that may be inſcribed in a circle.

Octagon, in fortification, denotes a place that has eight baſtions. See Fortification.

OCTAHEDRON, or Octaedron, in geometry, one of the five regular bodies, conſiſting of eight equal and equilateral triangles.

OCTANDRIA (*οκτω* " eight," and *ανηρ* a " man, or huſband,") the 8th claſs in Linnæus's ſexual ſyſtem; conſiſting of plants with hermaphrodite flowers, which are furniſhed with eight ſtamina, or male organs of generation. See Botany, p. 430.

OCTANT, or Octile, in aſtronomy, that aſpect of two planets, wherein they are diſtant an eighth part of a circle, or 45° degrees from each other.

OCTAPLA, in matters of ſacred literature, denotes a Polyglot Bible, conſiſting of eight columns, and as many different verſions of the ſacred text; viz. the original Hebrew both in Hebrew and Greek characters, Greek verſions, &c.

OCTATEUCH, an appellation given to the eight firſt books of the Old Teſtament.

OCTAVE, in muſic. See Interval.

OCTAVIA, daughter of Caius Octavius and ſiſter to Auguſtus Cæſar. See the following article. She was one of the moſt illuſtrious ladies of ancient Rome; her virtues and her beauty were equally conſpicuous.—Prideaux ſays ſhe was much handſomer than Cleopatra. She married Claudius Marcellus, and after his death M. Antony. Her marriage with Antony was a political match, to reconcile her brother and him together. Antony proved for ſome time attentive to her: but when he had ſeen Cleopatra, he neglected and deſpiſed her; and when ſhe attempted to withdraw him from this illegal amour by going to meet him at Athens, ſhe was rebuked and totally baniſhed from his preſence. This affront was highly reſented by her brother; and though Octavia endeavoured to pacify him by palliating Antony's behaviour, yet he reſolved to revenge her cauſe by arms. After the battle of Actium and the death of Antony, Octavia, forgetful of her own injuries, took into her houſe all the children of her huſband, and treated them with extraordinary tenderneſs. Marcellus, her ſon by her firſt huſband, was married to a niece of Auguſtus, and openly intended as a ſucceſſor to his uncle. His ſudden death plunged all the family into the greateſt grief. Virgil, whom Auguſtus patronized, undertook of himſelf to pay a melancholy tribute to the memory of a young man whom Rome had looked upon as her future father and patron. He was deſired to repeat his compoſition in the preſence of the emperor and his ſiſter. Octavia burſt into tears even when the poet began; but when he mentioned *Tu Marcellus eris*, ſhe ſwooned away. This tender and pathetic encomium upon the merit and the virtues of young Marcellus ſhe liberally rewarded, and Virgil received 10,000 ſeſterces, according to ſome 78l. 2s. 6d. for every one of the verſes. Octavia had two daughters by Antony, Antonia Major and Antonia Minor.—The elder married L. Domitius Ahenobarbus, by whom ſhe had Cn. Domitius, who was the father of the emperor Nero by Agrippina the daughter of Germanicus. Antonia Minor, who was as virtuous and as beautiful as her mother, married Druſus the ſon of Tiberius, by whom ſhe had Germanicus and Claudius, who reigned before Nero. The death of Marcellus conſtantly preyed upon the mind of Octavia, who died of grief or melancholy, about 11 years before the Chriſtian era. Her brother paid great regard to her memory, and pronounced her funeral oration himſelf. The Roman people alſo ſhowed their regard to her virtues, by wiſhing to pay her divine honours.—A daughter of the emperor Claudius by Meſſalina. She was betrothed to Silanus, but by the intrigues of Agrippina, ſhe was married to the emperor Nero in the 16th year of her age. She was ſoon after divorced under pretence of barrenneſs; and the emperor married exerciſed her enmity upon Octavia by to be baniſhed into Campania. She recalled by the people; but Poppæa, rmined on her ruin, cauſed her again to to an iſland, where ſhe was ordered to kill pening her veins. Her head was cut off Poppæa.

IANUS, or Octavius Cæsar, was ne- lius Cæſar the dictator, being the ſon of Accia his ſiſter, by Octavius a ſenator, and afterwards became the ſecond emperor of Rome. He was born in the year of the city 691, during the conſulſhip of Cicero. His uncle Julius Cæſar adopted him, and left him the greateſt part of his fortune. When he was but 20 years of age, he was raiſed to the conſulſhip. His youth and inexperience were ridiculed by his enemies; notwithſtanding which obſtacle, his prudence and valour raiſed his conſequence. He made war againſt his opponents on pretence of avenging the aſſaſſination of his uncle. He engaged in five civil wars with great ſucceſs, viz. The wars of Mutina, Peruſia, Philippi, Sicily, and Actium: the firſt and laſt of which were againſt M. Antony; the ſecond againſt L. Antony, brother of the triumvir; the third was againſt Brutus and Caſſius; and the fourth againſt Sext. Pompey, ſon of Pompey the Great. He united his forces with Antony's at the battle of Philippi; and had he not been ſupported by the activity and bravery of his colleague, he would doubtleſs have been totally ruined in that engagement. In this triumvirate with Antony and Lepidus, he obtained the weſtern parts of the Roman empire; and, like his other colleagues, more firmly to eſtabliſh his power, he proſcribed his enemies and cut them off. The triumvirate laſted for 10 years. He had given his ſiſter Octavia in marriage to Antony, to make their alliance more laſting; but when Cleopatra had charmed this unfortunate man, Octavia was repudiated. Auguſtus immediately took up arms to avenge the wrongs of his ſiſter; but perhaps more eager to remove a man whoſe power and exiſtence kept him in continual fear and conſtant dependence. Both parties met at Actium to decide the fate of Rome. Antony was ſupported by all the power of the eaſt, and Auguſtus by Italy. Cleopatra fled from the battle with 60 ſhips; and her flight ruined the intereſt of Antony, who followed her into Egypt. The conqueror ſoon after went into Egypt likewiſe, beſieged Alexandria, and honoured with a magnificent funeral his unfortunate colleague and the celebrated queen, whom the fear of being led in the victor's triumph at Rome had driven to commit ſuicide. After he had eſtabliſhed peace all over the world, he ſhut the gates of the temple of Janus, A. U. C. 753. He was twice determined to lay down the ſupreme power immediately after the victory obtained over Antony, and on account of his ill health; but his two faithful friends Mecænas and Agrippa diſſuaded him, and contended, that if he did he would leave it to be the prey of the moſt powerful, and expoſe himſelf to the greateſt dangers. He died at Nola in the 76th year of his age, after he had held the ſovereign power for 57 years.—He was an active emperor, and conſulted the good of the Romans with the greateſt anxiety and care. He viſited all the provinces except Africa and Sardinia, and his conſummate prudence and experience occaſioned many ſalutary laws. He is, ho[illegible]er, accuſed of licentiouſneſs and adultery; [illegible] goodneſs of his heart, the fidelity of his frien[illegible] and the many good qualities which the poets whom [illegible]ronized have perhaps truly celebrated, ma[illegible] though in the eye of ſtrict religion and true [illegible]ty but little, amends for his natural foibles. He was ambitious of being eſteemed handſome; and as he was publicly reported to be the ſon of Apollo according to his mother's declaration, he wiſhed his flatterers to repreſent him with the figure and attributes of that god. Like Apollo, his eyes were clear, and he affected to have it thought that they poſſeſſed ſome divine irradiation, and was well pleaſed if, when he fixed his eyes upon any body, they held down their eyes as if overcome by the glaring brightneſs of the ſun. He diſtinguiſhed himſelf by his learning; he was a complete maſter of the Greek language, and wrote ſome tragedies, beſides memoirs of his life and other works, which are now loſt. He married four times; but he was unhappy in all theſe connexions; and his only daughter Julia diſgraced herſelf and her father by the debauchery and licentiouſneſs of her manners. He recommended at his death his adopted ſon Tiberius as his ſucceſſor. He left his fortune partly to him and to Druſus, and made donations to the army and Roman people. The title of Auguſtus was conferred upon him by the ſenate after the battle of Actium and the final deſtruction of the Roman republic. The title continued afterwards, being given to his ſucceſſors in the empire. Virgil is ſaid to have written his Æneid at the deſire of Auguſtus, whom he repreſents under the amiable and perfect character of Æneas. The name of Octavius was very common at Rome; it was the name of a variety of men of very conſiderable rank.

OCTOBER, in chronology, the eighth month of Romulus's year, which the name implies; but tenth in the kalendar of Numa, Julius Cæſar, &c. The ſenate gave this month the name *Fauſtinus*, in compliment to Fauſtina, the wife of the emperor Antoninus; Commodus would have it called *Invictus*; and Domitian named it *Domitianus*; but in ſpite of all theſe attempts it ſtill retains its original name. This month was ſacred to Mars, and under his protection.

October Equus, a horſe annually ſacrificed to Mars in the month of October, either becauſe the horſe is a warlike animal, or to puniſh him for the taking of Troy. A race was run with chariots, drawn by two horſes, previous to the ſacrifices, and he that ran quickeſt was adjudged to be the victim.

OCTOSTYLE, in the ancient architecture, is the face of an edifice adorned with eight columns.

OCULUS, the EYE, in anatomy. See there, N° 142.

Oculus Beli, in natural hiſtory, one of the ſemipellucid gems, of a grayiſh white colour, variegated with yellow and with a black central nucleus: it is of a roundiſh form, and its variegations very beautifully repreſent the pupil and iris of the eye; whence the name.

Oculus Mundi, or *Lapis Mutabilis*. See HYDROPHANES.

Oculus Cati. See ASTERIA.

OCYMOPHYLLON, in botany: a name given by Buxbaum to a new genus of plants, the characters of which are theſe: The flower is of the ſtamineous kind, having no petals; this ſtands upon the embryo fruit, which afterwards becomes an oblong quadrangular ſeed-veſſel, divided into four cells, and containing roundiſh and very ſmall ſeeds; its leaves are like thoſe of the common ocymum or baſil, whence its name; and its place of growth is in damp marſhes. Boccone has deſcribed it under the improper name of *glaux*, calling it the *great, green-flowered, marſh glaux*.

OCYMUM, BASIL; a genus of the gymnoſpermia order, belonging to the didynamia claſs of plants; and in the natural method ranking under the 43d order, *Verticillatæ*. The upper lip of the calyx is orbiculated, the inferior one quadrifid; the corolla is reſupinated, with one lip quadrifid, the other undivided; the exterior filament ſends out a reflected proceſs at the baſe. There are eight ſpecies, all of them natives of warm climates, riſing from ſix inches to two feet in height, and having a ſtrong aromatic ſmell, reſembling that of cloves. One of the ſpecies is uſed in the kitchen, particularly by the French cooks, who make great uſe of it in their ſoups and ſauces. This riſes about ten inches high, ſending out branches by pairs oppoſite, from the bottom; the ſtalks and branches are four-cornered; the leaves are oval, ſpear-ſhaped, ending in acute points, and are indented on their edges; the whole plant is hairy, and has a ſtrong ſcent of cloves too powerful for moſt perſons, but to ſome it is very agreeable. Theſe plants are propagated by ſeeds, and will thrive in this country in the open air, and will even ripen their ſeeds if placed in a ſtove or airy glaſs-caſe.

OCZAKOW, or OCZAKOFF, a town of Turkey in Europe, and capital of a ſangiack of the ſame name, inhabited by Tartars. During a late war, here was a Turkiſh garriſon of 20,000 men. However, it was taken by the Ruſſians in 1737, and all thoſe that reſiſted were put to the ſword. The Ruſſians themſelves loſt

18,000 men in the aſſault. The Turks returned the ſame year with 70,000 men to retake it; but were obliged to retire, after the loſs of 20,000. In 1738, the Ruſſians withdrew their garriſon, and demoliſhed the fortifications. It is ſeated on the river Bog, to the weſt of the Nieper, or rather where they both unite and fall into the Black ſea. It is 42 miles ſouth-weſt of Bialagrod, and 190 north by eaſt of Conſtantinople. It has been lately a ſubject of great conteſt between the Ruſſians and Turks. The affair is freſh in our readers memories; but the following more particular account of the place, will not, we truſt, be unacceptable to our readers.—It is called by the Turks *Dzain Crimenda*, is ſeated at the influx of the Nieper into the Black ſea, 120 miles from Bender, to the ſouth-eaſt. The river is here above a mile broad. Hither the Turkiſh galleys retire which guard the mouth of the river, to prevent the Coſſacks from pirating upon the Black ſea. Here is no port, but good anchorage. It is defended by a caſtle, ſurrounded with walls 25 feet high; thoſe of the town are much lower. There are about 2000 people at Oczakow. Below the caſtle are two towns or ſuburbs, ſituated on the declivity of a hill, which on the other ſide has nothing but precipices. To the ſouth of theſe towns is another ſmall caſtle, where is ſome artil[illegible] to prevent veſſels from coming up the river. Here is alſo a tower, in which are always ſome Turks upon the watch to diſcover from afar any of the Coſſacks at ſea, and give notice of them to the galleys by a ſignal. The city is inhabited by Tartars, though garriſoned by Turks. E. Long. 30. 50. N. Lat. 46. 50.

ODA, in the Turkiſh ſeraglio, ſignifies a claſs, order, or chamber. The grand ſignior's pages are divided into five claſſes or chambers. The firſt, which is the loweſt in dignity, is called the *great oda*, from the greater number of perſons that compoſe it; theſe are the juniors, who are taught to read, write, and ſpeak the languages. The ſecond is called the *little oda*, where from the age of 14 or 15 years, till about 20, they are trained up to arms, and the ſtudy of all the polite learning the Turks are acquainted with. The third chamber, called *kilar oda*, conſiſts of 200 pages, who, beſides their other exerciſes, are under the command of the kilardgi-bachi, and ſerve in the pantry and fruitery. The fourth conſiſts only of 24, who are under the command of the khazineda-bachi, and have charge of the treaſure in the grand ſignior's appartment, which they never enter with clothes that have pockets. The fifth is called *kas oda* or *privy-chamber*; and is compoſed of only 40 pages who attend in the prince's chamber. Every night eight of theſe pages keep guard in the grand ſignior's bedchamber while he ſleeps: they take care that the light, which is conſtantly kept in the room, does not glare in his eyes, leſt it ſhould awake him: and if they find him diſturbed with troubleſome dreams, they cauſe him to be awaked by one of their agas.

Oda Bachi, or *Oddabaſſi*, an officer in the Turkiſh ſoldiery, equivalent to a ſerjeant or corporal among us. The common ſoldiers and janizaries, called *oldachis*, after having ſerved a certain term of years, are always preferred and made biquelairs; and of biquelairs in time become odobachis, i. e. corporals of companies, or chiefs of certain diviſions, whoſe number is not fixed; being ſometimes ten, and ſometimes twenty.

Their pay is ſix doubles per month; and they are diſtinguiſhed by a large felt, a foot broad and above a foot long, hanging on the back, with two long oſtrich feathers.

ODE, in poetry, a ſong, or compoſition proper to be ſung. See POETRY.

ODED, a prophet of the Lord, who being at Samaria, when the Iſraelites of the ten tribes returned from the war, with their King Pekah, together with 200,000 of the people of Judah captives, he went out to meet them, and ſaid, "You have ſeen that the Lord God of your fathers was in wrath againſt Judah; he has therefore delivered them into your hands, and you have ſlain them inhumanly, ſo that your cruelty has aſcended up into heaven; and more than this, you would make ſlaves of the children of Judah, who are your brethren, and would add this ſin to the many others you have committed: therefore, hear the counſel that I give you; ſend back theſe captives, leſt the Lord ſhould pour out his fury upon you." Oded having done ſpeaking, ſome of the chiefs of Samaria ſeconded him, and by their remonſtrances prevailed with the Iſraelites to ſet the captives at liberty (2 Chron. xxviii.) See AHAZ.

The enlargement of the captives being obtained, the principal men of Samaria took care of them, gave them clothes and food and other neceſſary aſſiſtance. After which they furniſhed them with horſes, becauſe the greateſt part of them were ſo tired and exhauſted that they were not able to walk. Thus they conducted them to Jericho, which was in the confines of the land of Judah. This is all that is come to our knowledge concerning the prophet Oded.

ODENSEE, the capital of the iſle of Funen, a place of ſuch high antiquity, that ſome Daniſh writers derive its foundation and name from Odin the god and hero of the Gothic nations. "Its name certainly occurs (ſays Mr Coxe) in the earlieſt ages of the Daniſh hiſtory; and it was town of great note long before Copenhagen exiſted. Odenſee ſtands upon a ſmall river, not navigable, and about two miles from the bay of Stegeſtrand. Many of the houſes are ancient, bearing dates about the middle of the 16th century; but part is newly built: it contains about 5200 inhabitants, who carry on ſome commerce, exporting chiefly grain and leather; the latter is much eſteemed, and its goodneſs is ſuppoſed to ariſe from a certain property in the river water, in which it is ſoaked for tanning. The Daniſh cavalry are ſupplied from thence with the greateſt part of their leathern accoutrements.

"Odenſee is the ſeat of a biſhop, which was founded by Harold Blaatand in 980, and is the richeſt in Denmark next to Copenhagen. It has a ſchool, endowed by the celebrated Margaret of Valdemar, in which a certain number of ſcholars, from ſix to 16 years of age, are inſtructed gratis: they live and board in the town, and each receives a yearly penſion; other ſcholarſhips have been alſo founded by private perſons. The whole number amounted to 70. There is alſo a gymnaſium, inſtituted by Chriſtian IV. for the admiſſion of ſtudents at the age of 16. The ſeminary was ſtill further improved by the liberality of Holberg the Daniſh hiſtorian, who protected letters with the ſame zeal with which he cultivated them. It is now greatly fallen from its former flouriſhing ſtate, containing, when I paſſed through the town, only eight ſtudents. The cathedral is a large old brick building, which has nothing remarkable except ſome coſtly monuments of a private Daniſh family. The church, which formerly belonged to the convent of Recolets, contains the ſepulchre of John king of Denmark, and of his ſon Chriſtian II." E. Long. 10. 27. N. Lat. 55. 28.

ODENATUS, a celebrated prince of Palmyra. He very early inured himſelf to bear fatigues, and by hunting leopards and wild beaſts, accuſtomed himſelf to the labours of a military life. He was a faithful friend to the Romans; and when Aurelian had been taken priſoner by Sapor king of Perſia, Odenatus warmly intereſted himſelf in his cauſe, and ſolicited his releaſe, by writing to the conqueror, and by ſending him preſents. The king of Perſia was offended at this liberty of Odenatus, he tore the letter, and ordered the preſents that were offered to be thrown into a river, and in order to puniſh Odenatus, who had the impudence, as he called it, to pay homage to ſo great a monarch as himſelf, he commanded him to appear before him, on pain of being devoted to inſtant deſtruction with all his family, if he dared to refuſe. Odenatus deſpiſed this haughty ſummons of Sapor, and oppoſed force by force. He obtained ſome conſiderable advantages over the troops of the Perſian king and took his wife priſoner, with a great and rich booty. Theſe ſervices were obſerved with gratitude by the Romans; and Gallienus, the then emperor, named Odenatus as his colleague on the throne, and gave the title of *Auguſtus* to his children, and to his wife the celebrated Zenobia. Odenatus inveſted with new power, reſolved to ſignalize himſelf more conſpicuouſly by conquering the barbarians of the north: but his exulting was of ſhort duration: he periſhed by the dagger of one of his own relations, whom he had ſlightly offended at a domeſtic entertainment.— He died at Emeſſa about the 267th year of the Chriſtian era. Zenobia ſucceeded to his titles and honours.

ODER, a river of Germany, which has its ſource near a town of the ſame name in Sileſia, and on the confines of Moravia. It runs north through that province, and then into the Marche of Brandenburg and Pomerania, where it forms a large lake, afterwards falling into the Baltic ſea by three mouths; between which lie the iſlands Uſedom and Wolin. It paſſes by ſeveral towns; as Ratibor, Oppelen, Breſlau, Glogan and Groſſen, in Sileſia; Francfort, Lebus, and Cuſtrin, in Brandenburg; and Gartz, Stetin, Cammin, Wallin, Uſedom, and Wolgaſt, in Pomerania.

ODEUM, in Grecian antiquity, a muſic theatre built by Pericles; the inſide of which was filled with ſeats and ranges of pillars, and on the outſide the roof deſcended ſhelving downwards from a point in the centre, with many bendings, in imitation of the king of Perſia's pavilion. Here the muſical prizes were contended for; and here alſo, according to Ariſtophanes was a tribunal.

ODIN (ſee Frea), in mythology, called alſo in the dialect of the Anglo-Saxons, *Woden* or *Wodan*, a name given by the ancient Scythians to their ſupreme god, and aſſumed, about 70 years before the Chriſtian era, by Sigge, a Scythian prince, who conquered the northern nations, made great changes in their government, manners, religion, and enjoyed great honours, and had even divine honours paid him. According to the account given of this conqueror by Snorro, the ancient hiſtorian of Norway, and his commentator Torfæus, Odin was a Scythian, who withdrew himſelf, with many others in his train, by flight, from the vengeance of the Romans, under the conduct of Pompey; and having officiated as a prieſt in his own country, he aſſumed the direction of the religious worſhip, as well as the civil government, of the nations which he conquered. Having ſubdued Denmark, Sweden, and Norway, he retired to Sweden, where he died. There is nothing certain in this account; but it is probable, that the god, whoſe prophet or prieſt this Scythian pretended to be, was named *Odin*, and that the ignorance of ſucceeding ages confounded the deity with his prieſt, compoſing out of the attributes of the one, and the hiſtory of the other, the character of the northern conqueror. He deluded the people by his enchantments and ſkill in magic: having cut off the head of one Mimer, who in his lifetime was in great reputation for wiſdom, he cauſed it to be embalmed, and perſuaded the Scandinavians that he had reſtored it to the uſe of ſpeech; and he cauſed it to pronounce whatever oracles he wanted. The Icelandic chronicles repreſent Odin as the moſt eloquent and perſuaſive of men; they aſcribe to him the introduction of the art of poetry among the Scandinavians, and likewiſe the invention of the Runic characters. He had alſo the addreſs to perſuade his followers, that he could run over the world in the twinkling of an eye; that he had the direction of the air and tempeſts; that he could transform himſelf into all ſorts of ſhapes, could raiſe the dead, could foretel things to come, deprive his enemies, by enchantment, of health and vigour, and diſcover all the treaſures concealed in the earth. They add, that by his tender and melodious airs, he could make the plains and mountains open and expand with delight; and that the ghoſts, thus attracted, would leave their infernal caverns, and ſtand motionleſs about him. Nor was he leſs dreadful and furious in battle; changing himſelf into the ſhape of a bear, a wild bull, or a lion, and amidſt ranks of enemies committing the moſt horrible devaſtation, without receiving any wound himſelf.

Henry's Hiſt. of Britain, Vol. II.

Dr Henry gives this account of him: "Odin is believed to have been the name of the one true God among the firſt colonies who came from the eaſt and peopled Germany and Scandinavia, and among their poſterity for ſeveral ages. But at length a mighty conqueror, the leader of a new army of adventurers from the eaſt, over-run the north of Europe, erected a great empire, aſſumed the name of *Odin*, and claimed the honours which had been formerly paid to that deity. From thenceforward this deified mortal, under the name of *Odin* or *Wodin*, became the chief object of the idolatrous worſhip of the Saxons and Danes in this iſland, as well as of many other nations. Having been a mighty and ſucceſsful warrior, he was believed to be the god of war, who gave victory, and revived courage in the conflict. Having civilized, in ſome meaſure, the countries which he conquered, and introduced arts formerly unknown, he was alſo worſhipped as the god of arts and artiſts. In a word, to this Odin his deluded worſhippers impiouſly aſcribed all the attributes which belong only to the true God: to him they built magnificent temples, offered many ſacrifices, and conſecrated the fourth day of the week, which is ſtill called by his name in England and in all the other countries where he was formerly worſhipped. Notwithſtanding all this, the founders of [illegible] kingdoms of the Anglo-Saxon heptarchy pretended to be deſcended from Wodin, and ſome of them at the diſtance only of a few generations."

Odin's Fire. We have this account of it in Gough's Camden. "In Evie pariſh, in the Orkneys, near the ſea, are ſome rocks, which frequently in the night appear on fire; and the church of St Michael there was often ſeen full of lights, called fires ſent by Odin to guard their tombs, but now ceaſed. This may be a meteor, or ſome inflammable matter on the cliffs, as at Charmouth, Dorſet."

ODINUS, a celebrated hero of antiquity, who flouriſhed about 70 years before the Chriſtian era, in the northern parts of ancient Germany, or in the modern kingdom of Denmark. He was at the ſame time a prieſt, a ſoldier, a poet, a monarch, and a victor. He impoſed upon the credulity of his ſuperſtitious countrymen, and made them believe that he could raiſe the dead, and that he was acquainted with futurity. When he had extended his power, and increaſed his fame by conqueſt and by artifice, he determined to die in a different way from other men. He aſſembled his friends, and with the ſharp point of a lance he made in his body nine different wounds in the form of a circle; and when expiring he declared that he was going to Scythia, where he ſhould become an immortal god. He added, that he would prepare bliſs and felicity for thoſe of his countrymen who lived a virtuous life, who fought with bravery, and who died like heroes in the field of battle. Theſe injunctions had the wiſhed-for effect: his countrymen ſuperſtitiouſly believed him, and conſtantly recommended themſelves to his protection when they engaged in battle; and they entreated him to receive the ſouls of ſuch as fell in war.

De Odio et Atia. See *False Imprisonment.*

The writ *de odio et atia* was anciently uſed to be directed to the ſheriff, commanding him to inquire whether a priſoner charged with murder was committed upon juſt cauſe of ſuſpicion, or merely *propter odium et atiam*, for hatred and ill will; and if upon the inquiſition due cauſe of ſuſpicion did not then appear, then there iſſued another writ for the ſheriff to admit him to bail. This writ, according to Bracton, ought not to be denied to any man; it being expreſsly ordered to be made out *gratis*, without any denial, by *magna charta*, c. 26. and ſtatute Weſtm. 2. 13 Edw. I. c. 29. But the ſtatute of Gloceſter, 6 Edw. I. c. 9. reſtrained it in the caſe of killing by miſadventure or ſelf defence, and the ſtatute 28 Edw. III. c. 9. aboliſhed it in all caſes whatſoever: but as the ſtat. 42 Ed. III. c. 1. repealed all ſtatutes then in being, contrary to the great charter, Sir Edward Coke is of opinion that the writ *de odio et atia* was thereby revived. See *Habeas Corpus*.

ODO (St,) ſecond abbot of Cluny in France, was illuſtrious for learning and piety in the 10th century. The ſanctity of his life contributed greatly to enlarge the congregation of Cluny; and he was ſo eſteemed, that popes, biſhops, and ſecular princes, uſually choſe him the arbiter of their diſputes. He died about the year 942, and his works are printed in the Bibliotheque of Cluny.

Odo Cantianus, ſo called as being a native of Kent in England, was a Benedictine monk in the 12th century, in which order his learning and eloquence raiſed him to the dignity of prior and abbot. Archbiſhop Becket was his friend; and his panegyric was made by John of Saliſbury. He compoſed Commentaries on the Pentateuch, and the Second Book of Kings; Moral Reflections on the Pſalms; treatiſes entitled, *De Onere Philiſtim; De Moribus Eccleſiaſticis; De Vitiis et Virtutibus Animæ*, &c.

ODOACER, according to Ennodius, was meanly born, and only a private man in the guards of the emperor Auguſtulus, when (A. D. 476, under the conſulſhip of Baſilicus and Armatus) the barbarians choſe him fo —————— The barbarians thought, as they often defended Italy, they had a right at leaſt to part of it; but upon demanding it they were refuſed, and the conſequence was a revolt. Odoacer is ſaid to have been a man of uncommon parts, capable alike of commanding an army or governing a ſtate. Having left his own country when he was very young, to ſerve in Italy, as he was of a ſtature remarkably tall, he was admitted among the emperor's guards, and continued in that ſtation till the above year; when, putting himſelf at the head of the barbarians in the Roman pay, who, though of different nations, had unanimouſly choſen him for their leader, he marched againſt Oreſtes, and his ſon Auguſtulus, who ſtill refuſed to ſhare any of the lands in Italy. The Romans were inferior both in numbers and valour, and were eaſily conquered: Oreſtes was ordered to be ſlain; but the emperor Auguſtulus was ſpared, and, though ſtripped of his dignity, was treated with humanity, and allowed a liberal ſum for his own ſupport and for that of his relations. Odoacer was proclaimed king of Italy; but aſſumed neither the purple nor any other mark of imperial conſequence. He was afterwards defeated and ſlain by Theodoric the Oſtrogoth. See Ostrogoth.

ODONTALGIA, the toothach. See Medicine, N° 210 and 411.

ODONTOIDE, in anatomy, an appellation given to the proceſs of the ſecond vertebra of the neck, from its reſemblance to a tooth.

ODOROUS, or Odoriferous, appellations given to whatever ſmells ſtrongly, whether they be fetid or agreeable; but chiefly to things whoſe ſmell is briſk and pleaſant.

ODYSSEY, the name of an epic poem compoſed by Homer, which, when compared with the Iliad, exhibits its author as the ſetting ſun, whoſe grandeur remains without the heat of his meridian beams.

The poet's deſign in the Odyſſey was to paint the miſeries of a kingdom in the abſence of its ſupreme governor, and the evil conſequences reſulting from a diſregard of law, and of that ſubordination without which ſociety cannot exiſt. With this view he ſets before his countrymen the adventures of a prince who had been obliged to forſake his native country, and to head an army of his ſubjects in a foreign expedition; and he artfully contrives, without interrupting the narrative, to make the reader acquainted with the ſtate of the country in the abſence of its ſovereign. The chief having glorioully finiſhed the enterpriſe in which he was engaged, was returning with his army; but in ſpite of all his eagerneſs to be at home, he was detained on the way by tempeſts for ſeveral years, and caſt upon ſeveral countries differing from each other in manners and in government. In theſe dangers his companions, not ſtrictly obeying his orders, periſh through their own fault. In the mean time the grandees of his country abuſe the freedom which his abſence gave them; conſume his eſtate; conſpire to deſtroy his ſon; endeavour to compel his queen to accept one of them for her huſband; and indulge themſelves in every ſpecies of violence, from a perſuaſion that he would never return. In this they were diſappointed. He returns; and diſcovering himſelf only to his ſon and ſome others who had maintained their allegiance, he is an eye witneſs of the inſolence of his enemies, puniſhes them according to their deſerts, and reſtores to his iſland that tranquillity and repoſe to which it had been a ſtranger during the many years of his abſence.

Such is the fable of the Odyſſey, in which there is no opportunity of diſplaying that vigour and ſublimity which characterize the Iliad. "It deſcends from the dignity of gods and heroes †, and warlike achievements; but in recompenſe we have more pleaſing pictures of ancient manners. Inſtead of that ferocity which reigns in the other poem, this preſents us with the moſt amiable images of hoſpitality and humanity; entertains us with many a wonderful adventure; and inſtructs us by ſuch a conſtant vein of morality and virtue which runs through the poem," ſometimes in precepts, and always in the conduct of the hero, that we ſhould not wonder if Greece, which gave the appellation of *wiſe* to men who uttered ſingle ſentences of truth, had given to Homer the title of *the father of virtue*, for introducing into his work ſuch a number of moral maxims. As a poem, however, the Odyſſey has its faults. The laſt twelve books are tedious and languid; and we are diſappointed by the calm behaviour of Penelope upon the diſcovery of her long loſt huſband.

OECONOMICS, the art of managing the affairs of a family or community; and hence the perſon who takes care of the revenues and other affairs of churches, monaſteries, and the like, is termed *œconomus*.

OECONOMY, denotes the prudent conduct, or diſcreet and frugal management, whether of a man's own eſtate or that of another.

Animal Oeconomy, comprehends the various operations of nature in the generation, nutrition and preſervation of animals †. The doctrine of the animal economy is nearly connected with phyſiology, which explains the ſeveral parts of the human body, their ſtructure, uſe, &c. See Anatomy and Medicine.

OECUMENICAL, ſignifies the ſame with *general* or *univerſal*; as, œcumenical council, biſhop, &c.

OEDEMA, or Phlegmatic Tumour, in medicine and ſurgery, a ſort of tumour attended with pale- ld, yielding little reſiſtance, retaining the print of the finger when preſſed with it, and accompanied with little or no pain.

This tumour obtains no certain ſituation in any particular part of the body, ſince the head, eyelids, hands, and ſometimes part, ſometimes the whole body, is afflicted with it. When the laſt mentioned is the caſe, the patient is ſaid to be troubled with a cachexy, leucophlegmatia, or dropſy. But if any particular part is more ſubject to this diſorder than another, it is certainly the feet, which are at that time called *ſwelled* or *œdematous feet*.

OEDERA, in botany: A genus of the polygamia ſegregata order, belonging to the ſyngeneſia claſs of plants. The calyces are multiflorous; the corollets tubular, hermaphrodite, and one or two feminine ones ligulate; the receptacle is chaffy; the pappus with numerous chaff.

OEDIPUS, the unfortunate king of Thebes, whoſe hiſtory is partly fabulous, flouriſhed about 1266 B. C. It is ſaid he was given by his father to a ſhepherd, who was ordered to put him to death, in order to prevent the misfortunes with which he was threatened by an oracle. But the ſhepherd, being unwilling to kill him with his own hands, tied him by the feet to a tree, that he might be devoured by wild beaſts. The infant was however found in this ſituation by another ſhepherd named *Phorbas*, who carried him to Polybus king of Corinth; where the queen, having no children, educated him with as much care as if he had been her own ſon. When he was grown up, he was informed that he was not the ſon of Polybus: on which, by order of the oracle, he went to ſeek for his father in Phocis; but ſcarce was he arrived in that country, when he met his father on the road, and killed him without knowing him. A ſhort time after, having delivered the country from the monſter called the *Sphinx*, he married Jocaſta, without knowing that ſhe was his mother, and had four children by her; but afterwards, being informed of his inceſt, he quitted the throne, and, thinking himſelf unworthy of the light, put out his eyes. Eteocles and Polynices, who were celebrated amongſt the Greeks, were born of this inceſtuous marriage.

OEGWA, a town on the Gold coaſt of Africa, ſtanding, according to Artus, on the brow of an eminence, raiſing itſelf by a gentle aſcent to a conſiderable height, and defended by rocks, againſt which the waves beat with the utmoſt violence, the noiſe of which is heard at a great diſtance.

Barbot affirms, that Oegwa contains above 500 houſes disjoined by narrow crooked ſtreets; and that from the ſea it has the appearance of an amphitheatre. Des Marchias reduces the number of houſes to 200, in the centre of which ſtands a large ſquare building, the repoſitory of their gold duſt and other commodities. The houſes are built of earth and clay, but convenient, and well furniſhed with chairs, ſtools, mats, carpets, earthen pots, and even looking glaſſes, which laſt they purchaſe from the Europeans. No part of the coaſt is better provided with all kinds of eatables, which are ſent in from the adjacent cantons, and ſold in public markets. Every thing is bought and ſold with gold duſt, which is the ſtandard of all other commodities, and brought hither in great abun-

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† *Blair's Lectures.*

† See *Generation*, *Nutrition*, &c.

dance from all quarters of Fetu, Abrambo, Aſſiento, and Mandingo. The gold is ſold by weight, and the quantity determined by nice ſcales, made in the country before it was frequented by the Europeans: a proof that thoſe negroes are not wholly ignorant of the more refined principles of mechanics. Next to gold, the chief commerce of the place conſiſts in the ſale of fiſh, of which they catch prodigious quantities on the coaſt. Although the natives are brave and warlike, yet in time of peace no people are more induſtrious, their whole time being employed in catching fiſh or cultivating the fruits of the earth. They are extremely expert in throwing the line, and fiſhing by the hook; nor is their intrepidity in combating the elements, and purſuing their employments in all kinds of weather, leſs aſtoniſhing. Every day in the week, except Wedneſday, which is ſacred to the Fetiche, they employ in their ſeveral occupations, and no ſeaſon of the year is exempted from fiſhing. Their canoes weather ſtorms which would endanger the largeſt ſhipping; and the negroes have the dexterity of making their advantage of thoſe ſeaſons, which oblige others to diſcontinue their labours, by throwing their lines with the ſame ſucceſs in tempeſtuous as in calm weather.

OELAND, an iſland of Sweden, ſeated on the Baltic ſea, between the continent of Gothland and the iſle of Gothland. It lies between 56° and 57° of north latitude, and between 17° and 18° of eaſt longitude. It is about 60 miles in length, and 15 in breadth; having a wholeſome air, and a fertile ſoil, with riſing hills, and ſeveral caſtles. It has no town of any great note.

OENANTHE, WATER DROPWORT: A genus of the digynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 45th order, *Umbellatæ*. The florets are difform; thoſe of the diſc ſeſſile and barren; the fruit crowned with the calyx. There are five ſpecies; of which the moſt remarkable is the crocata, or hemlock dropwort, growing frequently on the banks of ditches, rivers, and lakes, in many parts of Britain. The root and leaves of this plant are a ſtrong poiſon; ſeveral perſons have periſhed by eating it through miſtake, either for water parſnips or for celery, which laſt it reſembles pretty much in its leaves. So exceedingly deleterious is this plant, that Mr Lightfoot tells us he has heard the late Mr Chriſtopher d'Ehret, the celebrated botanic painter, ſay, that while he was drawing it, the ſmell or effluvia only rendered him ſo giddy, that he was ſeveral times obliged to quit the room, and walk out in the freſh air to recover himſelf; but recollecting at laſt what might be the probable cauſe of his repeated illneſs, he opened the door and windows of the room, and the free air then enabled him to finiſh his work without any more returns of the giddineſs. Mr Lightfoot informs us, that he has given a ſpoonful of the juice of this plant to a dog, but without any other effect than that of making him very ſick and ſtupid. In about an hour he recovered; and our author has ſeen a goat eat it with impunity. To ſuch of the human ſpecies as have unfortunately ate any part of this plant, a vomit is the moſt approved remedy.

Lobel calls this vegetable *œnanthe aquatica cicutæ facie*. It grows in great plenty all over Pembrokeſhire, and is called by the inhabitants *five-fingered root*: it is much uſed by them in cataplaſms for the felon or worſt kind of whitlow. They eat ſome parts of it, but carefully avoid the roots or ſtalk. Theſe indeed are of a moſt pernicious nature, and never fail to prove inſtantly fatal, unleſs a proper remedy is applied. The following inſtance, in addition to what has been ſaid, of the effects of this plant on man, is given in the Gentleman's Magazine for July 1747.

Three French priſoners being in the fields near the town of Pembroke, dug up a large quantity of a plant with its roots (which they took to be wild celery) to eat with their bread and butter for dinner. After waſhing it, while yet in the fields, they all three ate, or rather only taſted, of the roots.

As they were entering the town, one of them was ſeized with convulſions. The other two ran and ſent a ſurgeon, who endeavoured firſt to bleed, and then vomit him; but in vain, and he died preſently.

Ignorant of the cauſe of their comrade's death, and of their own danger, they gave of theſe roots to eight other priſoners, who all ate ſome of them with their dinner.

A few minutes after, the two who gathered the plants were ſeized in the ſame manner as the firſt; of which one died: The other was bled, and an emetic with great difficulty forced down, on account of his jaws being ſet. This operating, he recovered; but was ſome time much affected with a dizzineſs in his head, though not ſick, or in the leaſt diſordered in his ſtomach. The other eight, being bled and vomited immediately, were ſoon well.

This vegetable is ſo extremely like celery, and therefore, as in the above caſe, ſo apt to be miſtaken for it, that it cannot be enough guarded againſt by all who have a proper regard for themſelves. In the plate (ſee Plate CCCXLVII.), X is the ſhape of the root. *a*, The part cut off from the ſtalk. *b*, A branch taken from the bottom of the ſtalk, where the leaves are largeſt. *c*, A top branch with the umbels of flowers. *d*, An anterior view of the flower in its natural ſize. *e*, A poſterior view of the ſame. *f*, The anterior appearance of the flower through a microſcope. *g*, The poſterior view of the ſame. *h*, A view of the rudiments of the fruit after the decay of the flower. *i*, The ſame magnified. A *, The ſhape of a leaf of *celery*. B, a leaf of parſley.—Theſe two are printed, to prevent any unhappy miſtake in eating the poiſonous plant inſtead of either. We have added to the figures of this dangerous plant theſe leaves of celery and parſley, which, as we have ſaid, it greatly reſembles, in order to ſhow our readers how careful they ought to be in caſe of an accident becauſe of this ſimilarity.

OENKJE, in botany, a ſpecies of iris. See IRIS.

OENOPTÆ, in Grecian antiquity, a kind of cenſors at Athens, who regulated entertainments, and took care that none drank too much, nor too little.

OENOS, in ornithology, the name uſed by authors for the ſtock-dove, or wood-pigeon, called alſo by ſome *vinago*, ſomewhat larger than the common pigeon, but of the ſame ſhape and general colour. Its neck is of a fine changeable hue, as differently oppoſed to the light; and its breaſt, ſhoulders, and wings, are of

Oenothera. a fine purpliſh hue, or red wine colour, from whence it has its name *vinago*. Its legs are red, and feathered a little below the joint.

OENOTHERA, TREE-PRIMROSE: A genus of the monogynia order, belonging to the octandria claſs of plants: and in the natural method ranking under the 17th order, *Calycanthemæ*. The calyx is quadrifid; the petals four; the capſule cylindric beneath; the ſeeds naked. There are ſeven ſpecies; the moſt remarkable of which are,

1. The biennis, or common biennial tree-primroſe. It hath a long, thick, deeply ſtriking root; crowned with many large, oval, ſpear-ſhaped, plane, ſpreading leaves; upright, thick, firm, rough, hairy ſtems, riſing three or four feet high; garniſhed with long, narrow, lanceolate, cloſe ſitting leaves, irregularly; and at all the axillas, from the middle upwards, large bright yellow flowers.

2. Octovalvis, or octovalved, ſmooth, biennial tree-primroſe, hath upright, firm, ſomewhat hairy ſtems, riſing a yard high; oblong, ſpear-ſhaped, pointed, plane, ſmooth leaves; and at the axillas large bright yellow flowers.

3. The fruticoſa, or ſhrubby, narrow-leaved perennial tree-primroſe, hath long thick roots; upright under ſhrubby-like red ſtems, two or three feet high; ſpear ſhaped, lightly indented leaves: and at the axillas pedunculated cluſters of yellow flowers, ſucceeded by pedicelloted, acute angled capſules.

4. The pumila, or low perennial tree-primroſe, hath fibrous roots, crowned with many oval, ſpear-ſhaped, cloſe ſitting leaves: ſlender herbaceous ſtems from 10 to 12 inches long; garniſhed with ſpear-ſhaped, blunt, ſmooth leaves, having very ſhort footſtalks; and at the axillas ſmalliſh bright yellow flowers, ſucceeded by acute-angled capſules.

All theſe plants flower very profuſely in June and July, coming out almoſt half the length of the ſtalks from the axillas; and as the ſtalk advances in ſtature new flowers are produced, ſucceeding thoſe below; in which order the plants continue flowering from about midſummer till October: each flower is moderately large and conſpicuous, conſiſting of four plane petals, which with the calyx forms a very long tube below, and ſpreading above, generally expand moſt towards the evening; and are ſucceeded by plenty of ſeed in autumn for propagation.

Theſe plants are exotics from America; but are all very hardy, proſper in any common ſoil and ſituation, and have been long in the Engliſh gardens, eſpecially the three firſt ſorts; but the œnothera biennis is the moſt commonly known.

The firſt and ſecond ſpecies are biennial, and the third and fourth are perennial in root.

They are proper to be employed as plants of ornament for embelliſhing the pleaſure garden; they may be placed anywhere, and will effect a very agreeable variety three or four months with their plentiful blow of flowers.

The biennial kinds muſt be raiſed annually from ſeed, for they totally periſh after they have flowered. But the perennials, once raiſed, continue for years by the root.

The propagation of all the ſorts is by ſeed, and the perennial alſo by parting the roots.

Oenotria OENOTRIA, an ancient name of Italy; ſo called from the *Oenotri*, (Virgil); inhabiting between Pæſtum and Tarentum, (Ovid). Originally Arcadians, (Dionyſius Halicarnaſſæus), who came under the conduct of Oenotrus ſon of Lycaon, 17 generations before the war of Troy, or 459 years, at 27 years each generation, and gave name to the people. Cato derives the name from *Oenotrus*, king of the Sabines and Etruſcans; but Varro from *Oenotrus*, king of the Latins; and Servius from the Greek name for wine, for which Italy was famous; of which opinion is Strabo.

Oeſtrus. OENOTRIDES (Strabo, Pliny), two ſmall iſlands in the Tuſcan ſea, over againſt Velia, a town of Lucania, called *Pontia* and *Iſcia*; now *Penza* and *Iſchia*, on the coaſt of the Principato Citra, or to the weſt of Naples. So called from the *Oenotri*, an ancient people of Italy.

OESEL, an iſland of the Baltic ſea, at the entrance of the gulf of Livonia. It is about 70 miles in length, and 50 in breadth, and contains 10 pariſhes. It is defended by the fortreſſes of Airenſburg and Sonneburg. It lies between 22° and 24° of eaſt longitude, and between 58° and 59° of north latitude.

OESOPHAGUS, in anatomy, the GULA, or *Gullet*, is a membranaceous canal, reaching from the fauces to the ſtomach, and conveying into it the food taken in at the mouth. See ANATOMY, N° 92.

Plate CCCL. OESTRUS, in zoology, a genus of inſects belonging to the order of diptera. It has no mouth; but three punctures, without trunk or beak: Antennæ taper, proceeding from a lenticular joint. There are five ſpecies.

1. *Bovis, the breeze* or *gad fly.*—Thorax yellow, with a black tranſverſe line between the wings: Abdomen tawny, with fine black tranſverſe lines; laſt ſegment black: Wings white, with a brown tranſverſe line, and three brown ſpots. Size of the large blue fly. Depoſites its eggs under the ſkin on the backs of oxen, where the maggots are nouriſhed the whole winter till the month of June; and plague the cattle ſo all the ſummer, that they are obliged to fly for refuge into the water, and dare not quit it the whole day.

2. *The hæmorrhoidalis.*—Body long, black, covered with tawny hair; middle of the thorax leſs hairy: wings immaculate; antennæ very ſhort: Length half an inch. Depoſites its eggs in the rectum of horſes, and occaſions great torments. See BOTTS.

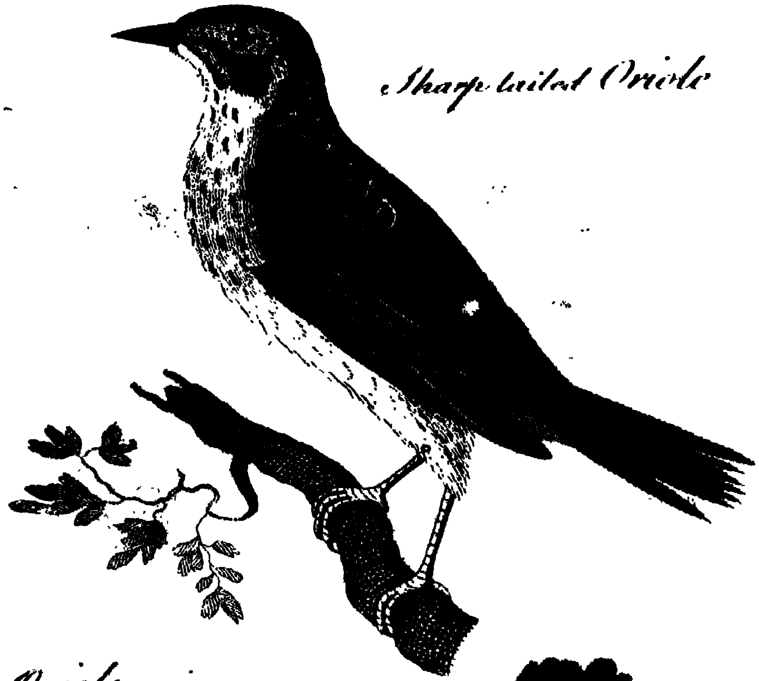
3. *Ovis, the gray fly.*—Spotted with black; front pale yellow; legs browniſh; wings with ſhort black veins: length half an inch. Breeds in the frontal ſinus of ſheep; where the maggots hatched from the eggs, lodge the whole winter, vellicating the internal membranes, and often bringing on death.

5. *The naſalis.*—Body black: but the head, thorax, and abdomen, covered with pale red hair, except the firſt ſegment of the latter, which is covered with white hair; the wings immaculate. Breeds in the fauces of horſes, entering by their noſe.

5. *The tarandi.*—Thorax yellow; with a black line between the wings, which are immaculate: Abdomen tawny, laſt ſegment black. Infeſt the back of the rein deer, ſo as greatly to retard the breed. The rein deer of Lapland are obliged every year to fly to the Alpine mountains, to eſcape the purſuit of theſe

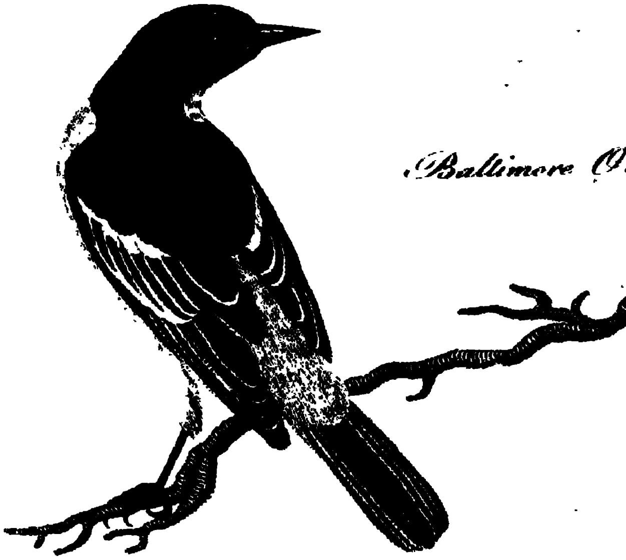
Plate CCCL.

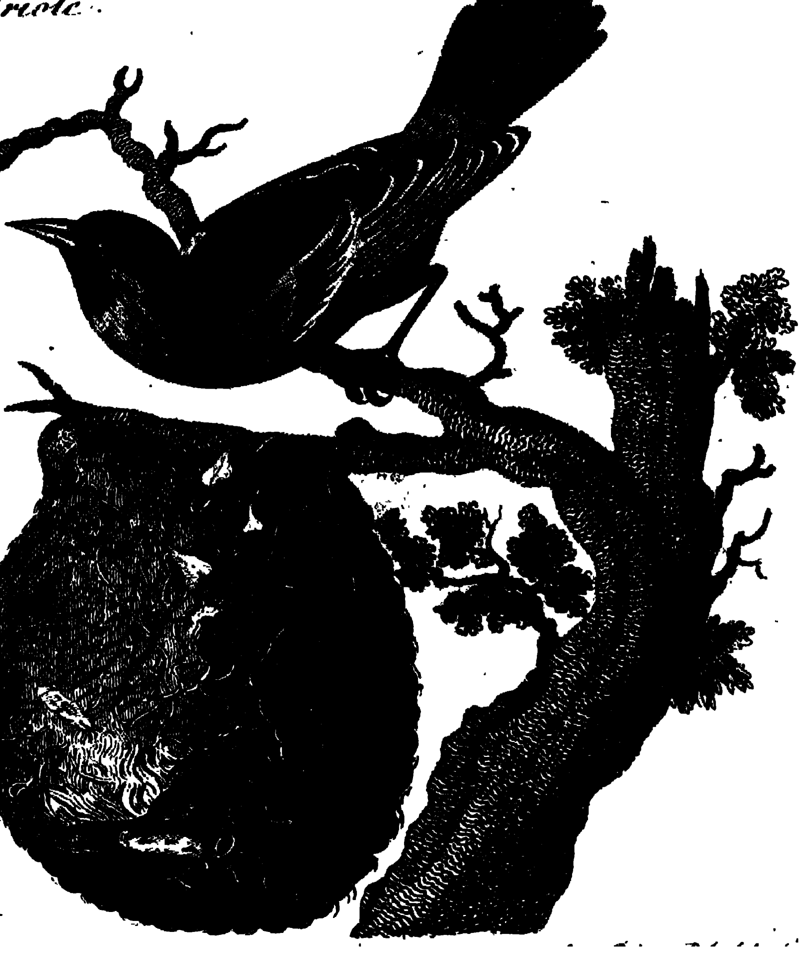
Sharp-tailed Oriole



Oestrus.

Baltimore Oriole.





Ocelaxochitl.

inſects: yet a fourth part of their number periſh by them at two years old; the reſt are emaciated, and have their ſkins ſpoiled. It is one of the moſt curious genera of inſects. They are diſtinguiſhed into ſeveral ſpecies, by reaſon of the different places wherein they depoſite their eggs. Some, inſtructed by nature that their eggs cannot be hatched but under the ſkins of living creatures, ſuch as bulls, cows, rein deer, ſtags, and camels, fix upon them at the inſtant of laying their eggs. From the hinder part of their body iſſues a whimble of wonderful ſtructure. It is a ſcaly cylinder, compoſed of four tubes, which draw out like the pieces of a ſpying glaſs; the laſt is armed with three hooks and is the gimblet with which the œſtri bore through the tough hides of horned cattle. The animal ſeems to experience no pain from the puncture, unleſs the inſect, plunging too deep, touches ſome nervous fibre; in which caſe, the beaſt runs about, and becomes furious. The eggs being hatched, the grub feeds on the matter of the wound. The place of its abode forms upon the body of the quadrupeds a bunch ſometimes above an inch high. When full grown, the larva breaks through the tumor, and ſlides down to the ground; for doing which it takes the cool of the morning, that it may neither be overpowered by the heat of the day, nor chilled by the cold of the night: it then digs itſelf a burrow, into which it retires. Its ſkin grows hard, and turns to a very ſolid ſhell. There it is transformed to a chryſalis, and afterwards to a winged inſect. Nature has provided for every exigence: the ſhell wherein the œſtrus is encloſed, is of ſo ſtrong a texture that it could not make its way out, if at one of the ends there were not a ſmall valve, faſtened only by a very ſlight filament. The firſt puſh the œſtrus makes, the door gives way and the priſon opens. The inſect wings its way to woods and places frequented by cattle.

OETA (anc. geog.), a mountain of Theſſaly, extending from Thermopylæ weſtward to the Sinus Ambracius, and in ſome meaſure cutting at right angles the mountainous country ſtretching out between Parnaſſus to the ſouth, and Pindus to the north. At Thermopylæ it is very rough and high, riſing and ending in ſharp and ſteep rocks, affording a narrow paſſage between it and the ſea from Theſſaly to Locris (Strabo), with two paths over it; the one above [illegible], very ſteep and high; the other through the country of the Ænianes, much eaſier and readier for travellers; by this it was that Leonidas was attacked in rear by the Perſians (Pauſanias). Here Hercules laid himſelf on the funeral pile (Silius Italicus, Ovid); the [illegible] thence called *Pyra* (Livy), who ſays, that the extreme mountains to the eaſt are called *Oeta*; and hence the poets allege, that day, night, ſun, and ſtars, aroſe from Oeta (Seneca, Statius, Silius Italicus, Catullus, Virgil's *Culex*)—circumſtances which ſhow the height of this mountain.

OETING, a town of Germany, in Upper Bavaria, under the juriſdiction of Buckhauſen. It is divided into the upper and the lower town, and ſeated on the river Inn, eight miles weſt of Buckhauſen. E. Long. 12. 47. N. Lat. 48. 0. There is a great reſort of pilgrims to the old chapel.

Oeting, or *Oetingen*, a town of Germany, in the circle of Suabia, and capital of a county of the ſame name, ſeated on the river Wirnitz. E. Long. 10. 45. N. Lat. 48. 52.

Oeting, a county of Germany, in the circle of Suabia, bounded on the north and eaſt by Franconia; on the ſouth by the duchy of Neuburg; and on the weſt by that of Wirtemberg. It is about 40 miles from eaſt to weſt, and 20 from north to ſouth.

OFFA's-dyke, an intrenchment caſt up by Offa, a Saxon king, to defend England againſt the incurſions of the Welſh. It runs through Hertfordſhire, Shropſhire, Montgomeryſhire, Denbighſhire, and Flintſhire.

OFFANTO, a river of Italy, in the kingdom of Naples. It riſes in the Apennine mountains, in the Farther Principato; and paſſing by Conza, and Monte Verde, it afterwards ſeparates the Capitanata from the Baſilicata and the Terra-di-Bari, and then it falls into the gulf of Venice, near Salpe.

OFFENCE, in law, an act committed againſt the law, or omitted where the law requires it.

OFFERINGS. The Hebrews had ſeveral kinds of offerings, which they preſented at the temple. Some were free-will offerings, and others were of obligation. The firſt fruits, the tenths, the ſin offerings, were of obligation; the peace offerings, vows, offerings of wine, oil, bread, ſalt, and other things, which were made to the temple or to the miniſters of the Lord, were offerings of devotion. The Hebrews called all offerings in general *corban*. But the offerings of bread, ſalt, fruits, and liquors, as wine and oil, which were preſented to the temple, they called *mincha*. The ſacrifices are not properly offerings, and are not commonly included under that name. See Corban and Sacrifice.

The offerings of grain, meal, bread, cakes, fruits, wine, ſalt, and oil, were common in the temple. Sometimes theſe offerings were alone, and ſometimes they accompanied the ſacrifices. Honey was never offered with the ſacrifices; but it might be offered alone in the quality of firſt fruits. Now theſe were the rules that were obſerved in the preſenting of thoſe offerings, called in Hebrew *mincha*, or *korbon mincha*; in the Septuagint, *offerings of ſacrifice*; and the ſame by St Jerome, *oblationem ſacrificii*; but by our tranſlators, *meat offerings* (Lev. ii. 1, &c.) There were five ſorts of theſe offerings: 1. Fine flour or meal. 2. Cakes of ſeveral ſorts, baked in an oven. 3. Cakes baked upon a plate. 4. Another ſort of cakes, baked upon a gridiron, or plate with holes in it. 5. The firſt fruits of the new corn, which were offered either pure and without mixture, or roaſted or parched in the ear, or out of the ear.

The cakes were kneaded with oil olive, or fried with oil in a pan, or only dipped in oil after they were baked. The bread offered to be preſented upon the altar, was to be without leaven; for leaven was never offered upon the altar, nor with the ſacrifices. But they might make preſents of common bread to the prieſts and miniſters of the temple. See Cake, &c.

The offerings now mentioned were appointed on account of the poorer ſort, who could not go to the charge of ſacrificing animals. And even thoſe that offered living victims were not excuſed from giving meal, wine, and ſalt, which was to go along with the greater ſacrifices. And alſo thoſe that offered only oblations of bread or of meal, offered alſo oil, incenſe, ſalt, and wine, which were in a manner the ſeaſoning of it. The prieſt in waiting received the offerings from the hand of him that offered them; laid a part of them upon the altar, and reſerved the reſt for his own ſubſiſtence: that was his right as a miniſter of the Lord. Nothing was burnt quite up but the incenſe, of which the prieſt kept back nothing for his own ſhare.

When an Iſraelite offered a loaf to the prieſt, or a whole cake, the prieſt broke the loaf or the cake into two parts, ſetting that part aſide that he reſerved to himſelf, and broke the other [illegible] crumbs; poured oil upon it, ſalt, wine; and incenſe, and ſpread the whole upon the fire of the altar. If theſe offerings be accompanied by an animal for a ſacrifice, it was all thrown upon the victim, to be conſumed along with it.

If theſe offerings were the ears of new corn, either of wheat or barley, theſe ears were parched at the fire or in the flame, and rubbed in the hand, and then offered to the prieſt in a veſſel; over which he put oil, incenſe, wine, and ſalt, and then burnt it upon the altar, firſt having taken as much of it as of right belonged to himſelf.

The greateſt part of theſe offerings were voluntary, and of pure devotion. But when an animal was offered in ſacrifice, they were not at liberty to omit theſe offerings. Every thing was to be ſupplied that was to accompany the ſacrifice, and which ſerved as a ſeaſoning to the victim. There are ſome caſes in which the law requires only offerings of corn, or bread: for example, when they offered the firſt fruits of their harveſt, whether they were offered ſolemnly by the whole nation, or by the devotion of private perſons.

As to the quantity of meal, oil, wine, or ſalt, which was to go along with the ſacrifices, we cannot eaſily ſee that the law had determined it. Generally the prieſt threw an handful of meal or crumbs upon the fire of the altar, with wine, oil, and ſalt in proportion, and all the incenſe. All the reſt belonged to him, the quantity depended upon the liberality of the offerer. We obſerve in more places than one, that Moſes appoints an aſſaron, or the tenth part of an ephah of meal, for thoſe that had not wherewithal to offer the appointed ſin offerings (Lev. v. 11. xiv. 21.) In the ſolemn offerings of the firſt fruits for the whole nation, they offered an entire ſheaf of corn, a lamb of a year old, two tenths or two aſſarons of fine meal mixed with oil, and a quarter of an hin of wine for the libation. (Lev. xxiii. 10, 11, 12, &c.)

In the ſacrifice of jealouſy (Numb. v. 15.), when a jealous huſband accuſed his wife of infidelity, the huſband offered the tenth part of a ſatum of barley-meal, without oil or incenſe, becauſe, it was a ſacrifice of jealouſy, to diſcover whether his wife was guilty or not.

The offerings of the fruits of the earth, of bread, of wine, oil, and ſalt, are the moſt ancient of any that have come to our knowledge. Cain offered to the Lord of the fruits of the earth, the firſt fruits of his labour (Gen. iv. 3, 4.) Abel offered the firſtlings of his flocks, and of their fat. The heathen have nothing more ancient in their religion, that theſe ſorts of offerings made to their gods. They offered clean wheat, flour, and bread.

OFFICE, a particular charge or truſt, or a dignity attended with a public function, See Honour.—The word is primarily uſed in ſpeaking of the offices of judicature and policy; as the office of ſecretary of ſtate, the office of a ſheriff, of a juſtice of peace, &c.

Office alſo ſignifies a place or apartment appointed for officers to attend in, in order to diſcharge their reſpective duties and employments; as the ſecretary's office, ordnance office, exciſe office, ſignet office, paper office, pipe office, ſix clerks office, &c.

Office, in architecture, denotes all the apartments appointed for the neceſſary occaſions of a palace or great houſe; as kitchen, pantrics, confectionaries, &c.

Office, in the canon law, is uſual for a benefice, that has no juriſdiction annexed to it.

Duty upon Offices *and Penſions*, a branch of the king's extraordinary perpetual revenue, conſiſting in a payment of 1s. in the pound (over and above all other duties) out of all ſalaries, fees, and perquiſites of offices and penſions payable by the crown. This highly popular taxation was impoſed by ſtat. 31 Geo. II. c. 22. and is under the direction of the commiſſioners of the land tax.

OFFICER, a perſon poſſeſſed of a poſt or office. See the preceding article.

The great officers of the crown, or ſtate, are, The lord high ſteward, the lord high chancellor, the lord high treaſurer, the lord preſident of the council, the lord privy ſeal, the lord chamberlain, the lord high conſtable, and the earl marſhal; each of which ſee under its proper article.

Non-commiſſioned Officers, are ſerjeant majors, quarter maſter ſerjeants, ſerjeants, corporals, drum and fife majors; who are nominated by their reſpective captains, and appointed by the commanding officers of regiments, and by them reduced without a court martial.

Orderly non-commiſſioned Officers, are thoſe who are orderly, or on duty for that week; who, on hearing the drum beat for orders, are to repair to the place appointed to receive them, and to take down in writing, in the orderly book, what is dictated by the adjutant, or ſerjeant major: they are then immediately to ſhow theſe orders to the officers of the company, and afterwards warn the men for duty.

Flag Officers. See *Flag Officers*, and Admirals.

Commiſſion Officers, are ſuch as are appointed by the king's commiſſion. Such are all from the general to the cornet and enſign incluſive. They are thus called in contradiſtinction to [illegible] commiſſioned officers. See *Non-commiſſioned* Officers.

General Officers, are thoſe whoſe command is not limited to a ſingle company, troop, or regiment; but extends to a body of forces compoſed of ſeveral regiments: ſuch are the general, lieutenant general, major general, and brigadier.

Officers of the Houſehold. See the article Houſehold.

Staff Officers, are ſuch as, in the king's preſence, bear a white ſtaff or wand; and at other times, on their going abroad, have it carried before them by a footman bare-headed: ſuch are the lord ſteward, lord chamberlain, lord treaſurer, &c.

The white ſtaff is taken for a commiſſion; and, at the king's death, each of theſe officers breaks his ſtaff over the herſe made for the king's body, and by this means lays down his commiſſion, and diſcharges all his inferior officers.

Subaltern Officers, are all who adminiſter juſtice in the name of ſubjects; as thoſe who act under the earl marſhal, admiral, &c. In the army, the ſubaltern officers are the lieutenants, cornets, enſigns, ſerjeants, and corporals.

OFFICIAL, in the canon law, an eccleſiaſtical judge, appointed by a biſhop, chapter, abbot, &c. with charge of the ſpiritual juriſdiction of the dioceſe.

Official, is alſo a deputy appointed by an archdeacon as his aſſiſtant, who ſits as judge in the archdeacon's court.

OFFICINAL, in pharmacy, an appellation given to ſuch medicines, whether ſimple or compound, as are required to be conſtantly kept in the apothecaries ſhops. The *officinal ſimples* are appointed, among us, by the College of Phyſicians; and the manner of making the compoſitions directed in their diſpenſatory. See Pharmacy.

OFFING, or Offin, in the ſea language, that part of the ſea a good diſtance from ſhore, where there is deep water, and no need of a pilot to conduct the ſhip: thus, if a ſhip from ſhore be ſeen ſailing out to ſeaward, they ſay, *ſhe ſtands for the offing*; and if a ſhip, having the ſhore near her, have another a good way without her, or towards the ſea, they ſay, *that ſhip is in the offing.*

OFF-SETS, in gardening, are the young ſhoots that ſpring from the roots of plants; which being carefully ſeparated, and planted in a proper ſoil, ſerve to propagate the ſpecies.

Off-sets, in ſurveying, are perpendiculars let fall, and meaſuring from the ſtationary lines to the hedge, fence, or extremity of an encloſure.

OGEE, or O. G. in architecture, a moulding conſiſting of two members, the one concave and the other convex; or of a round and hollow, like an S. See Architecture.

OGHAMS, a particular kind of ſteganography, or writing in cypher practiſed by the Iriſh; of which there were three kinds: The firſt was compoſed of certain lines and marks, which derived their power from their ſituation and poſition, as they ſtand in relation to one principal line, over or under which they are placed, or through which they are drawn; the principal line is horizontal, and ſerveth for a rule or guide, whoſe upper part is called the left, and the under ſide the right; above, under, and through which line, the characters or marks are drawn, which ſtand in the place of vowels, conſonants, diphthongs, and triphthongs. Some authors have doubted the exiſtence of this ſpecies of writing in cypher, called *Ogham* among the Iriſh: but theſe doubts are perhaps ill founded; for ſeveral MSS. in this character ſtill exiſt, from which Mr Aſtle has given a plate of them.

OGILBY (John), an eminent writer, was born in or near Edinburgh, about the 17th of November 1600. His father having ſpent his eſtate, and being priſoner in the King's Bench for debt, could contribute but little to his education; however, he obtained ſome knowledge in the Latin grammar, and afterwards ſo much money as to procure his father's diſcharge from priſon, and to bind himſelf an apprentice to a dancing-maſter in London; when, by his dexterity in his profeſſion, and his complaiſant behaviour to his maſter's ſcholars, he obtained money to buy out the remainder of his time, and ſet up for himſelf. But being afterwards appointed to dance in the duke of Buckingham's great maſk, he by a falſe ſtep ſtrained a vein in the inſide of his leg, which occaſioned his being ever after ſomewhat lame. When Thomas earl of Strafford was made lord-lieutenant of Ireland, he was entertained as a dancing maſter in his family, and made one of the earl's troop of guards; at which time he compoſed a humorous piece called the *Character of a Trooper.* He was ſoon after appointed maſter of the revels in Ireland, and built a theatre at Dublin. About the time of the concluſion of the war in England, he left Ireland; and, being ſhipwrecked, came to London in a neceſſitous condition; but ſoon after walked to Cambridge, where, being aſſiſted by ſeveral ſcholars, he became ſo complete a maſter of the Latin tongue, that in 1649 he publiſhed a tranſlation of Virgil. He ſoon after learned Greek; and in 1660 publiſhed, in folio, a tranſlation of Homer's Iliad, with Annotations. About two years after he went into Ireland, where he was made maſter of the revels by patent. He then built another theatre in Dublin, which coſt him about 1000l. He publiſhed at London, in folio, a tranſlation of Homer's Odyſſey, with Annotations; and afterwards wrote two heroic poems, entitled the *Epheſian Matron*, and the *Roman Slave.* He next compoſed the Carolics, an epic poem, in 12 books, in honour of King Charles I. but this was entirely loſt in the fire of London; when Mr Ogilby's houſe in White Friars was burnt down, and his whole fortune, except to the value of five pounds, deſtroyed. He, however, ſoon procured his houſe to be rebuilt, ſet up a printing-office within it, was appointed his majeſty's coſmographer and geographic printer, and printed ſeveral great works, tranſlated or collected by himſelf and his aſſiſtants, particularly his Atlas. He died in 1676.

OGIVE, in architecture, an arch or branch of a Gothic vault; which, inſtead of being circular, paſſes diagonally from one angle to another, and forms a croſs with the other arches. The middle, where the ogives croſs each other, is called the *key*; being cut in form of a roſe, or a *cul de lampe.* The members or mouldings of the ogives are called *nerves*, *branches*, or *reins*; and the arches which ſeparate the ogives, *double arches.*

OGYGES, king of the Thebans, or, according to others, of Ogygia and Actæ, afterwards called *Bœotia and Attica.* He is recorded to have been the firſt founder of Thebes and Eleuſis. The famous deluge happened in his time, in which ſome ſay he periſhed with all his ſubjects, 1796 B. C.

OGYGIA (Homer), the iſland of Calypſo; placed by Pliny in the Sinus Scylaceus, in the Ionian ſea, oppoſite to the promontory Lacinium; by Mela in the ſtrait of Sicily, calling it *Ææa*; which others place at the promontory Circeium, and call it the iſland of *Circe.*

Ogygia, the ancient name of Thebes in Bœotia: ſo called from Ogyges, an ancient king, under whom happened

Ohio
Oil.

happened a great deluge, 1020 years before the firſt Olympiad.

OHIO, a river of North America, called by the French the *Beautiful River*, has its ſource between the Allegany mountains and the lake Erie; and running ſouth-weſt through a moſt delightful country, and alſo receiving many ſmaller rivers in its paſſage, at length falls into the Miſſiſſippi, in about 37 degrees of latitude. The French had ſeveral forts on and near it; but the whole country through which it flows was ceded by the peace of 1763 to the Britiſh.

OHETEROA, one of the South ſea iſlands lately diſcovered, is ſituated in W. Long. 150. 47. S. Lat. 22. 27. It is neither fertile nor populous; nor has it any harbour or anchorage fit for ſhipping, and the diſpoſition of the people is hoſtile to ſuch as viſit them.

OIL, in natural hiſtory, an unctuous inflammable ſubſtance, drawn from ſeveral natural bodies, as animal and vegetable ſnbſtances.

Animal oils are their fats, which are originally vegetable oils: all animal ſubſtances yield them, together with their volatile ſalts, in diſtillation.

Vegetable oils are obtained by expreſſion, infuſion, and diſtillation.

The oils by expreſſion are obtained from the ſeed, leaves, fruit, and bark of plants; thus, the ſeed of muſtard, and of the ſun flower, almonds, nuts, beech maſt, &c. afford a copious oil by expreſſion; and the leaves of roſemary, mint, rue, wormwood, thyme, ſage, &c. the berries of juniper, olives, Indian cloves, nutmeg, mace, &c. the barks of cinnamon, ſaſſafras, and clove, yield a conſiderable proportion of eſſential oil by diſtillation.

The method of procuring oils by expreſſion is very ſimple: thus, if either ſweet or bitter almonds, that are freſh, be pounded in a mortar, the oil may be forced out with a preſs, not heated: and in the ſame manner ſhould the oil be preſſed from linſeed and muſtard. The avoiding the uſe of heat, in preparing theſe oils intended for internal medicinal uſe, is of great importance, as heat gives them a very prejudicial rancidneſs.

This method holds of all thoſe vegetable matters that contain a copious oil, in a looſe manner, or in certain cavities or receptacles; the ſides whereof being broken, or ſqueezed, makes them let go the oil they contain: and thus the zeſt or oil of lemon peel, orange peel, citron peel, &c. may be readily obtained by preſſure, without the uſe of fire. But how far this method of obtaining oils may be applied to advantage, ſeems not hitherto conſidered. It has been commonly applied to olives, almonds, linſeed, rape ſeed, beech maſt, ben-nut, walnuts, bay-berries, mace, nutmeg, &c. but not, that we know of, to juniper berries, caſhew nuts, Indian cloves, pine apples, and many other ſubſtances that might be enumerated, both of foreign and domeſtic growth. It has, however, been of late ſucceſsfully applied to muſtard ſeed, ſo as to extract a curious gold-coloured oil, leaving a cake behind, fit for making the common table muſtard.

Certain dry matters, as well as moiſt ones, may be made to afford oils by expreſſion, by grinding them into a meal, which being ſuſpended to receive the vapour of boiling water, will thus be moiſtened ſo as to afford an oil in the ſame manner as almonds; and thus an oil may be procured from linſeed, hemp ſeed, lettuce ſeed, white poppy ſeed, &c.

Oil.

As to the treatment of oils obtained by expreſſion, they ſhould be ſuffered to depurate themſelves by ſtanding in a moderately cool place, to ſeparate from their water, and depoſite their fæces; from both which they ought to be carefully freed. And if they are not thus rendered ſufficiently pure, they may be waſhed well with freſh water, then thoroughly ſeparated from it again by the ſeparating glaſs, whereby they will be rendered bright and clear.

The next claſs of oils are thoſe made by infuſion, or decoction, wherein the virtues of ſome herb or flower are drawn out in the oil; as the oil of roſes, chamomile, hypericum, alder, &c. However, theſe require to be differently treated: thus, for the ſcented flowers, particularly roſes, inſolation does [illegible]; becauſe much boiling would exhale their more fragrant parts: but oils impregnated with green herbs, as thoſe of chamomile and alder, require long boiling, before they receive the green colour deſired. And, in general, no oils will bear to be boiled any longer than there remains ſome aqueous humidity, without turning black.

There are many compound oils prepared in the ſame manner, viz. by boiling and inſolation, and then ſtraining off the oil for uſe.

The ſame contrivance has likewiſe its uſe in making eſſences for the ſervice of the perfumer; not only where eſſential oils cannot be well obtained in ſufficient quantities, but alſo where they are too dear. The eſſential oil of jeſſamine flowers, honeyſuckles, ſweet briar, damaſk roſes, lilies of the valley, &c. are either extremely dear, or ſcarcely obtainable by diſtillation; and, in ſome of them, the odorous matter is ſo ſubtle, as almoſt to be loſt in the operation. But if theſe flowers be barely infuſed in fine oil of nuts, or oil of ben, drawn without heat, and kept in a cool place, their ſubtile odorous matter will thus paſs into the oil, and richly impregnate it with their flavour. And theſe eſſences may be rendered ſtill more perfect by ſtraining off the oil at firſt put on, and letting it ſtand again, without heat, upon freſh flowers; repeating the operation twice or thrice.

Oils or fats may likewiſe be obtained, by boiling and expreſſion, from certain animal ſubſtances; for the membranes which contain the fat, being chopped ſmall, and ſet in a pan over the fire, become fit for the canvas bags, and, by preſſure, afford a large quantity of fat; as we ſee in the art of chandlery, which thus extracting the oily matter, leaves a cake behind, commonly called *graves*.

As to the eſſential oils of vegetables, they are obtained by diſtillation with an alembic and a large refrigeratory. Water muſt be added to the materials in ſufficient quantity, to prevent their burning; and they ſhould be macerated or digeſted in that water, a little time before diſtillation. The oil comes over with the water; and either ſwims on the top, or ſinks to the bottom, according as it is ſpecifically heavier or lighter than water.

This proceſs is applicable to the diſtilling of the eſſential oils from flowers, leaves, barks, roots, woods, gums, and balſams, with a ſlight alteration of circumſtances, as by longer digeſtion, briſker diſtillation, &c. according to the tenacity and hardneſs of the ſubject, the ponderoſity of the oil, &c.

Eſſential oils may be divided into two claſſes, according to their different ſpecific gravities; ſome floating upon water, and others readily ſinking to the bottom. Thus, the eſſential oils of cloves, cinnamon, and ſaſſafras, readily ſink, whereas thoſe of lavender, marjoram, mint, &c. ſwim, in water: the lighteſt of theſe eſſential oils is, perhaps, that of citron peel, which even floats in ſpirit of wine; and the heavieſt ſeems to be oil of ſaſſafras.

For obtaining the full quantity of the more ponderous oils from cinnamon, cloves, ſaſſafras, &c. it is proper to reduce the ſubjects to powder; to digeſt this powder for ſome days in a warm place, with thrice its quantity of ſoft river water, made very ſaline by the addition of ſea ſalt, or ſharp with oil of vitriol; to uſe the ſtrained decoction, or liquor left behind in the ſtill, inſtead of common water, for freſh digeſtion; to uſe for the ſame purpoſe the water of the ſecond running, after being cleared of its oil; not to diſtil too large a quantity of theſe ſubjects at once; to leave a conſiderable part of the ſtill, or about one fourth, empty; to uſe a briſk fire, or a ſtrong boiling heat, at the firſt, but to ſlacken it afterwards; to have a low ſtill head, with a proper internal ledge and current leading to the noſe of the worm; and, finally, to cohabate the water, or pour back the liquor of the ſecond running upon the matter in the ſtill, repeating this once or twice.

The directions here laid down for obtaining the ponderous oils to advantage, are eaſily transferred to the obtaining of the lighter; ſo that we need not dwell particularly upon them.

Many of the eſſential oils being dear, it is a very common practice to adulterate or debaſe them ſeveral ways, ſo as to render them cheaper both to the ſeller and the buyer. Theſe ſeveral ways ſeem reducible to three general kinds, each of which has its proper method of detection, viz. 1. With expreſſed oils. 2. With alcohol. And, 3. With cheaper eſſential oils.

If an eſſential oil be adulterated with an expreſſed oil, it is eaſy to diſcover the fraud; by adding a little ſpirit of wine to a few drops of the ſuſpected eſſential oil, and ſhaking them together; for the ſpirit will diſſolve all the oil that is eſſential, or procured by diſtillation, and leave all the expreſſed oil that was mixed with it, untouched.

If an eſſential oil be adulterated with alcohol, or rectified ſpirit of wine, it may be done in any proportion, up to that of an equal quantity, without being eaſily diſcoverable either by the ſmell or taſte: the way to diſcover this fraud, is to put a few drops of the oil into a glaſs of fair water; and if the oil be adulterated with ſpirit, the water will immediately turn milky, and, by continuing to ſhake the glaſs, the whole quantity of ſpirit will be abſorbed by the water, and leave the oil pure at top.

Finally, If an eſſential oil be adulterated by a cheaper eſſential oil, this is commonly done very artfully: the method is to put fir wood, turpentine, or oil of turpentine, into the ſtill, along with the herbs to be diſtilled for their oil, ſuch as roſemary, lavender, origanum, &c. and by this means the oil of turpentine diſtilled from theſe ingredients comes over in great quantity, and intimately blended with the oil of the genuine ingredient. The oils thus adulterated always diſcover themſelves in time, by their own flavour being overpowered by the turpentine ſmell: but the ready way to detect the fraud, is to drench a piece of rag, or paper, in the oil, and hold it before the fire; for thus the grateful flavour of the plant will fly off, and leave the naked turpentine ſcent behind.

The virtues of oils, being the ſame with thoſe of the ſubſtances from whence they are obtained, may be learned under their ſeveral articles, to which we refer.

We have this account of different oils in the iſland of Madagaſcar in the Univerſal Hiſtory.

Oils are of different ſorts, the moſt common are thoſe of menach-tanhetanhe, menach ſignifying oil, menachil, menach-chouivau, menach-maſoutra, menach-vourave, menach-apocapouc, menach-vintang, and menach-arame. Menach-tanhetanhe is drawn from a particular plant, called, in the language of the country, *tanhetanhe*, and known in Europe by the name of *palma Chriſti*, or *ricinus*. Menachil is an oil from the ſeed of ſeſame, which they call *voancaze*; a great quantity whereof is made in the valley of Amboule. Menach-chouivau is drawn from a fruit of the ſize of an almond, extremely good in liquors or meats. Menach-maſoutra is drawn from nuts, the fruit of the tree which produces dragon's blood. Menach-vourave is drawn from a fruit named *fontſi*. Menach-apocapouc is ſqueezed from the fruit apocapouc, extremely poiſonous. Menach-vintang is an oil from large acorns, or maſt. Menach-arame is drawn from nuts, the fruit of the tree from which the gum tacamahaca is produced.

Rock Oil. See PETROLEUM.

Eſſential Oil of Roſes. See ROSES.

Method of Purifying Rancid OILS. See CHEMISTRY, N° 1431.

OINTMENT, in pharmacy. See UNGUENT.

OKEHAM, the capital of Rutlandſhire, in England, ſeated in a rich and pleaſant valley, called the *vale of Catmus*. It is pretty well built, has a good church, a free-ſchool, and an hoſpital. W. Long. 0. 45. N. Lat. 52. 40.

OKINGHAM, OCKINGHAM, or *Woxingham*, a large town of Berkſhire, in England, noted for the manufacture of ſilk ſtockings. W. Long. 0. 50. N. Lat. 51. 26.

OLAUS MAGNUS. See MAGNUS.

OKRA. See HIBISCUS.

OLAX, in botany: A genus of the monogynia order, belonging to the triandria claſs of plants; and in the natural method ranking with thoſe of which the order is doubtful. The calyx is entire; the corolla funnel-ſhaped and trifid; the nectarium tetraphyllous.

OLD AGE. See LONGEVITY. Many methods have been propoſed for lengthening life, and rendering old age comfortable. Cornaro's Treatiſe on this ſubject is known to every body, and needs not be quoted. To ſome of our readers the following ſet of reſolutions will perhaps be new, and may certainly be uſeful.

The old men ſhould reſolve, except the reaſons for a change be invincible, to live and to die in the public profeſſion of the religion in which they were born and bred. To avoid all profane talk and intricate debates on ſacred topics. To endeavour to get the better of the intruſions of indolence of mind and body, thoſe certain harbingers of enfeebling age. Rather to wear out, than to ruſt out. To riſe early, and as often as poſſible to go to bed before midnight. Not to nod in company, nor to indulge repoſe too frequently on the couch in the day. To waſte as little of life in ſleep as may be, for we ſhall have enough in the grave. Not to give up walking; nor to ride on horſeback to fatigue. Experience, and a late medical opinion, determine to ride five miles every day: Nothing contributes more to the preſervation of appetite, and the prolongation of life. Cheyne's direction to the valetudinary, "to make exerciſe a part of their religion," to be religiouſly obſerved. To continue the practice of reading, purſued for more than fifty years, in books on all ſubjects; for variety is the ſalt of the mind as well as of life. Other people's thoughts, like the beſt converſation of one's companions, are generally better and more agreeable than one's own. Frequently to think over the virtues of one's acquaintance, old and new. To admit every cheerful ray of ſunſhine on the imagination. To avoid retroſpection on a paſt friendſhip, which had much of love in it; for memory often comes when ſhe is not invited. To try to think more of the living and leſs of the dead; for the dead belong to a world of their own. To live within one's income, be it large or little. Not to let paſſion of any ſort run away with the underſtanding. Not to encourage romantic hopes nor fears. Not to drive away hope, the ſovereign balm of life, though he is the greateſt of all flatterers. Not to be under the dominion of ſuperſtition or enthuſiaſm. Not wilfully to undertake any thing for which the nerves of the mind or the body are not ſtrong enough. Not to run the race of competition, or to be in another's way. To avoid being joſtled too much in the ſtreet, being overcome by the noiſe of the carriages, and not to be carried even by curioſity itſelf into a large crowd. To ſtrive to embody that dignified ſentiment, "to write injuries in duſt, but kindneſſes in marble." Not to give the reins to conſtitutional impatience, for it is apt to hurry on the firſt expreſſions into the indecency of ſwearing. To recollect, that he who can keep his own temper may be maſter of another's. If one cannot be a ſtoic, in bearing and forbearing, on every trying occaſion, yet it may not be impoſſible to pull the check-ſtring againſt the moroſeneſs of ſpleen or the impetuoſity of peeviſhneſs. Anger is a ſhort madneſs. Not to fall in love, now on the precipice of threeſcore, nor expect to be fallen in love with. A connexion between ſummer and winter is an improper one. Love, like fire, is a good ſervant, but a bad maſter. Love is death, when the animal ſpirits are gone. To contrive to have as few vacant hours upon one's hands as poſſible, that idleneſs, the mother of crimes and vices, may not pay its viſit. To be always doing of ſomething, and to have ſomething to do. To fill up one's time, and to have a good deal to fill up: for time is the materials that life is made of. If one is not able by ſituation, or through the neceſſity of raiſing the ſupplies within the year, or by habit (for virtue itſelf is but habit), to do much oſtentatious good, yet do as little harm as poſſible. To make the beſt and the moſt of every thing. Not to indulge too much in the luxury of the table, nor yet to underlive the conſtitution. The gout, rheumatiſm, and dropſy, in the language of the Spectator, ſeem to be hovering over the diſhes. Wine, the great purveyor of pleaſure, and the ſecond in rank among the ſenſes, offers his ſervice, when love takes his leave. It is natural to catch hold of every help, when the ſpirits begin to droop. Love and wine are good cordials, but are not proper for the beverage of common uſe. Reſolve not to go to bed on a full meal. A light ſupper and a good conſcience are the beſt receipts for a good night's reſt, and the parents of undiſturbing dreams. Not to be enervated by the flatulency of tea. Let the ſecond [illegible] third morning's thought be to conſider of the employment for the day; and one of the laſt at night to inquire what has been done in the courſe of it. Not to let one's tongue run at the expence of truth. Not to be too communicative nor unreſerved. A cloſe tongue, with an open countenance, are the ſafeſt paſſports through the journey of the world. To correct the error of too much talking, and reſtrain the narrativeneſs of the approaching climacteric. To take the good-natured ſide in converſation. However, not to praiſe every body, for that is to praiſe nobody. Not to be inquiſitive, and eager to know ſecrets, nor be thought to have a head full of other people's affairs. Not to make an enemy, nor to loſe a friend. To aim at the eſteem of the public, and to leave a good name behind. Not to be ſingular in dreſs, in behaviour, in notions, or expreſſions of one's thoughts. Never to give bad advice, and to ſtrive not to ſet a bad example. Seldom to give advice till aſked, for it appears like giving ſomething that is ſuperfluous to one's ſelf. Not to like or diſlike too much at firſt ſight. Not to wonder, for all wonder is ignorance that poſſeſſion falls ſhort of expectation. The longing of twenty years may be diſappointed in the unanſwered gratification of a ſingle hour. Whilſt we are wiſhing, we ſee the beſt ſide; after we have taken poſſeſſion, the worſt. Reſolve to attend to the arguments on both ſides, and to hear every body againſt every body. The mind ought not to be made up, but upon the beſt evidence. To be affectionate to relations, which is a kind of ſelf-love, in preference to all other acquaintance. But not to omit paying the commanding reſpect to merit, which is ſuperior to all the accidental chains of kindred. Not to debilitate the mind by new and future compoſitions. Like the ſpider, it may ſpin itſelf to death. The mind, like the field, muſt have its fallow ſeaſon. The leiſure of the pen has created honourable acquaintance, and pleaſed all it has wiſhed to pleaſe. To reſolve not to be too free of promiſes, for performances are ſometimes very difficult things. Not to be too much alone, nor to read, nor meditate, or talk too much on points that may awaken tender ſenſations, and be too pathetic for the ſoul. To enjoy the preſent, not to be made too unhappy by reflection on the paſt, not to be oppreſſed by invincible gloom on the future. To give and receive comfort, thoſe neceſſary alms to a diſtreſſed mind. To be conſtantly thankful to Providence for the plenty hitherto poſſeſſed, which has preſerved one from the dependence on party, perſons, and opinions, and kept one out of debt. The appearance of a happy ſituation, and opportunities of taſting many worldly felicities (for content has ſeldom perverted itſelf into diſcontent), has induced many to conclude, that one muſt be pleaſed with one's lot in life; and it occaſions many to look with the eye of innocent envy. To reſolve more than ever to ſhun every public ſtation and reſponſibility of conduct. To be ſatisfied with being maſter of one's ſelf, one's habits, now a ſecond nature, and one's time. Determined not to ſolicit, unleſs trampled upon by fortune, to live and die in the harneſs of trade, or a profeſſion. To take care that pity (humanity is not here meant) does not find out one in the endurance of any calamity. When pity is within call, contempt is not far off. Not to wiſh to have a greater hold of life, nor to quit that hold. The poſſible tenure of exiſtence is of too ſhort poſſeſſion for the long night that is to ſucceed: therefore not a moment to be loſt. Not to loſe ſight, even for a ſingle day, of theſe good and proverbial doctors—diet—merryman—and quiet. Reſolved to remember and to recommend, towards tranquillity and longevity, the three oral maxims of Sir Hans Sloane —"Never to quarrel with one's ſelf—one's wife—or one's prince." Laſtly, Not to put one's ſelf too much in the power of the elements, thoſe great enemies to the human frame; namely, the ſun—the wind—the rain—and the night air.

Old Man of the Mountain. See **Assassins.**

OLDCASTLE (Sir John), called the *Good Lord Cobham*, was born in the reign of Edward III. and was the firſt author as well as the firſt martyr among the Engliſh nobility: he obtained his peerage by marrying the heireſs of that Lord Cobham who with ſo much virtue and patriotiſm oppoſed the tyranny of Richard II. By his means the famous ſtatute againſt proviſors was revived, and guarded againſt by ſeverer penalties; he was one of the leaders of the reforming party; was at great expence in procuring and diſperſing copies of Wickliffe's writings among the people, as well as by maintaining a number of his diſciples as itinerant preachers. In the reign of Henry V. he was accuſed of hereſy; the growth of which was attributed to his influence. Being a domeſtic in the king's court, the king delayed his proſecution that he might reaſon with him himſelf; but not being able to reclaim him to the church of Rome, he in great diſpleaſure reſigned him to its cenſure. He was apprehended and condemned for hereſy; but eſcaping from the Tower, lay concealed for four years in Wales, until the rumour of a pretended conſpiracy was raiſed againſt him, and a price ſet upon his head: he was at laſt ſeized, and executed in St Giles's Fields; being hung alive in chains upon a gallows, and burned by a fire placed underneath. He wrote "Twelve Concluſions, addreſſed to the Parliament of England."

OLDENBURG, a title of the royal houſe of Denmark. The origin of this illuſtrious family, we are told, is this:—

On the death of Chriſtopher king of Denmark, &c. in 1448, without iſſue, there was a great conteſt about the ſucceſſion; and a variety of factions were raiſed, particularly in Sweden and Norway, for the promotion of different perſons; and various animoſities and numerous diſcords were excited by the ſeveral parties, in order each to obtain their own ends.

As ſoon as theſe intrigues were known in Denmark, the ſenate reſolved to proceed to the election of a king; for it did not appear expedient to commit the government of affairs to the queen dowager at a time when they had every thing to fear from the two neighbouring crowns. At this time a lord of great weight, property, and ambition, ſought the queen in marriage, the more eaſily to pave his way to the throne. This is a fact mentioned by Pontanus and Meurſius, though neither takes notice of his name. But as for a great number of years there was no precedent for electing a king out of the body of nobility, though agreeable to law, the queen entered into the views of the ſenate, and declared ſhe would give her hand to no prince who ſhould not be judged deſerving of the crown by the ſupreme council of the nation.

The advantages which would have accrued from annexing the duchy of Sleſwick and Holſtein to the crown, made the ſenate firſt caſt their eye [illegible] Adolphus. This matter required no long deliberation; all ſaw the conveniences reſulting from ſuch an union, and gave their aſſent. Immediately an embaſſy was deſpatched with the offer to Adolphus; but that prince conſulting the good of his ſubjects, whoſe intereſt would have been abſorbed in the ſuperior weight of Denmark, declined it, with a moderation and diſintereſtedneſs, altogether uncommon among princes. However, that he might not be wanting in reſpect to the ſenate, he propoſed to them his nephew Chriſtian, ſecond ſon to Theodoric, count of Oldenburg, a prince bred up at the court of Adolphus from his infancy. The propoſition was ſo agreeable to the ſenate, that, without loſs of time, the ambaſſadors were ſent to Theodoric, to demand either of his ſons he ſhould pitch upon for their king. Theodoric's anſwer to the ambaſſadors was remarkable: "I have three ſons, ſays he, of very oppoſite qualities. One is paſſionately fond of pleaſure and women; another breathes nothing but war, without regarding the juſtice of the cauſe; but the third is moderate in his diſpoſition, prefers peace to the din of arms, yet ſtands unrivalled in valour, generoſity, and magnanimity." He ſaid he painted theſe characters for the ſenate's information, deſiring they would chooſe which of the young princes they believed would render the kingdom happieſt. It wa[illegible] matter which would admit of no heſitation: with one voice the ſenate declared for that prince whoſe panegyric the father had ſo warmly drawn; and under theſe happy auſpices commenced the origin of the grandeur of the houſe of Oldenburg, at this day ſeated on the throne of Denmark.

Oldenburg (Henry), a learned German gentleman in the 17th century, was deſcended from the noble family of his name, who were earls of the county of Oldenburg, in the north part of Weſtphalia, for many generations. He was born in the duchy of Bremen in the Lower Saxony; and during the long Engliſh parliament in King Charles I.'s time, was appointed conſul for his countrymen, at London, after the uſurpation of Cromwell: but being diſcharged of that employ, he was made tutor to the lord Henry O'Bryan, an Iriſh nobleman, whom he attended to the univerſity of Oxford, where he was admitted to ſtudy in the Bodleian library in the beginning of the year 1656. He was afterwards tutor to William lord Cavendiſh, and was acquainted with Milton the poet. During his reſidence at Oxford, he became alſo acquainted with the members of that body there which gave birth to the Royal Society; and upon the foundation of this latter, he was elected fellow; and when the ſociety found it neceſſary to have two ſecretaries, he was choſen aſſiſtant ſecretary to Dr Wilkins. He applied himſelf with extraordinary diligence to the buſineſs of his office, and began the publication of the Philoſophical Tranſactions with N° I. in 1664. In order to diſcharge this taſk with greater credit to himſelf and the ſociety, he held a correſpondence with more than ſeventy learned perſons, and others, upon a vaſt variety of ſubjects, in different parts of the world. This fatigue would have been inſupportable, had not he, as he told Dr Liſter, managed it ſo as to make one letter anſwer another; and that to be always freſh, he never read a letter before he had pen, ink, and paper, ready to anſwer it forthwith; ſo that the multitude of his letters cloyed him not, nor ever lay upon his hands. Among others, he was a conſtant correſpondent of Mr Robert Boyle, with whom he had a very intimate friendſhip; and he tranſlated ſeveral of that ingenious gentleman's works into Latin.

Mr Oldenburg continued to publiſh the Tranſactions, as before, to N° XXXVI. June 25. 1677. After which the publication was diſcontinued till the January following, when it was again reſumed by his ſucceſſor in the ſecretary's office, Mr Nehemiah Grew, who carried it on till the end of February 1678. Our author dying at his houſe at Charleton, near Greenwich in Kent, in the month of Auguſt that year, was interred there.

OLDENLANDIA, in botany: A genus of the tetrandria monogynia claſs. Its characters are theſe: The empalement of the flower is permanent, ſitting upon the germen; the flower has four oval petals, which ſpread open, and four ſtamina, terminated by ſmall ſummits; it hath a roundiſh germen, ſituated under the flower, crowned by an indented ſtigma; the germen afterwards turns to a globular capſule, with two cells filled with ſmall ſeeds. We have but one ſpecies of this plant in the Engliſh gardens: but Linnæus enumerates ſix.

OLDHAM (John), an eminent Engliſh poet in the 17th century, ſon of a Nonconformiſt miniſter, was educated under his father, and then ſent to Edmund-hall in Oxford. He became uſher to the free-ſchool at Croydon in Surry; where he received a viſit from the earls of Rocheſter and Dorſet, Sir Charles Sedley, and other perſons of diſtinction, merely upon the reputation of ſome verſes of his which they had ſeen in manuſcript. He was tutor to ſeveral gentlemen's ſons ſucceſſively; and having ſaved a ſmall ſum of money, came to London, and became a perfect votary to the bottle, being an agreeable companion. He was quickly found out here by the noblemen who had viſited him at Croydon, who brought him acquainted with Mr Dryden. He lived moſtly with the earl of Kingſton at Holme-Pierpoint in Nottinghamſhire, where he died of the ſmallpox in 1683, in the 30th year of his age. His acquaintance with learned authors appears by his ſatires againſt the Jeſuits, in which there is as much learning as wit diſcovered. Mr Dryden eſteemed him highly. His works are printed in 2 vols. 12mo. They chiefly conſiſt of ſatires, odes, tranſlations, paraphraſes of Horace and other authors, elegiac verſes, imitations, parodies, familiar epiſtles, &c.

OLD-HEAD, ſituated in the county of Cork, and province of Munſter, four miles ſouth of Kinſale, in the barony of Courcies, Ireland: it is a promontory, running far into the ſea, on which is a lighthouſe for the convenience of ſhipping. A mile from its extremity is an ancient caſtle of the lords of Kinſale, built from one ſide of the iſthmus to the other, which defended all the lands towards the head: this place was formerly called *Duncearma*, and was the old ſeat of the Iriſh kings. The iſthmus, by the working of the ſea, was quite penetrated through, ſo as to form a ſtupendous arch, under which boats might paſs from one bay to the other. Among the rocks of this coaſt there are aviaries of good hawks; alſo the ſea eagles or oſpreys build their neſts and breed them.

OLDMIXON (John), was deſcended from an ancient family in Somerſetſhire: he was a violent party-writer and malevolent critic, who would ſcarcely have been remembered, if Pope, in reſentment of his abuſe, had not condemned him to immortality in his Dunciad. His party-writings procured him a place in the revenue at Liverpool, where he died at an advanced age in the year 1745. Beſides his fugitive temporary pieces, he wrote a Hiſtory of the Stuarts, in folio; a Critical Hiſtory of England, 2 vols. 8vo; a volume of Poems, ſome dramatic pieces, &c.; none of them worthy of notice, his principal talent being that of falſifying hiſtory.

Old-wife, or *Wraſſe*. See Labrus.

Old-wife *Fiſh*. See Baliſtes.

Old-woman's island, a narrow ſlip of land, about two miles long, ſeparated from Bombay in the Eaſt Indies by an arm of the ſea, which, however, is paſſable at low water. It terminates at one extremity in a ſmall eminence, on which a look-out houſe is kept for veſſels. Near the middle are three tombs kept conſtantly white, as land-marks into the harbour. From the end of the iſland a dangerous ledge of rocks ſhoots forth, which are not very eaſily cleared. It produces only paſture for a few cattle.

OLEA, in botany, the *olive-tree*: A genus of the monogynia order, belonging to the diandria claſs of plants; and in the natural method ranking under the 44th order, *Sepiariæ*. The corolla is quadrifid, with the ſegments nearly ovate. The fruit is a monoſpermous plum.

There are three ſpecies of the olea. 1. The *Europea*, or common olive tree, riſes with upright ſolid ſtems, branching numerouſly on every ſide, 20 or 30 feet high; ſpear-ſhaped, ſtiff, oppoſite leaves, two or three inches long, and half an inch or more broad; and at the axillas ſmall cluſters of white flowers, ſucceeded by oval fruit.

This ſpecies is the principal ſort cultivated for its fruit; the varieties of which are numerous, varying in colour, and quality.

It is a native of the ſouthern warm parts of Europe, and is cultivated in great quantities in the ſouth of France, Italy, and Portugal, for the fruit to make the olive oil, which is in ſo great repute, and is tranſported to all parts, to the great advantage of thoſe countries where the trees grow in the open ground: the green fruit is alſo in much eſteem for pickling, of which we may ſee plenty in the ſhops.

2. The *capenſis*, or cape box-leaved olive, riſes with ſhrubby ſtems, branching numerouſly from the bottom, ſix or ſeven feet high; ſmall, oval, thick, ſtiff, ſhining leaves; and at the axillas ſmall cluſters of whitiſh flowers, ſucceeded by ſmall fruit of inferior value.

3. *Olea odoratiſſima* (Indian name, *queſa;* Japaneſe name, *Skio Ran, it: Sju Ran*) is thus deſcribed by Thunberg, *bulbis fibroſis, foliis enſiformibus, ſeſſilibus, floribus pendulis.* (See Plate CCCXLIX.) The flower of the olea odoratiſſima is by ſome ſaid to give the fine flavour to the green tea; but Thunberg attributes the ſaid flavour to the *Cemellie ſeſerque.*

Olive trees are eaſily propagated by ſhoots; which, when care has been taken to ingraft them properly, bear fruit in the ſpace of eight or ten years. Thoſe kinds of olive trees which produce the pureſt oil, and bear the greateſt quantity of fruit, are ingrafted on the ſtocks of inferior kinds.

Different names are aſſigned by the French to the different varieties of the olive tree; and of theſe they reckon 19, whilſt in Florence are cultivated no fewer than 32.

Olive ſhoots are ingrafted when in flower. If the operation has been delayed, and the tree bears fruit, it is thought ſufficient to take off a ring of bark, two fingers breadth in extent, above the higheſt graff. In that caſe the branches do not decay the firſt year; they afford nouriſhment to the fruit, and are not lopped off till the following ſpring. Olive trees are commonly planted in the form of a quincunx, and in rows at a conſiderable diſtance from one another. Between the rows is is uſual to plant vines, or to ſow ſome kind of grain. It is obſerved, that olives, like many other fruit trees, bear well only once in two years. The whole art of dreſſing theſe trees conſiſts in removing the ſuperfluous wood; for it is remarked, that trees loaded with too much wood produce neither ſo much fruit nor of ſo good a quality.

Their propagation in England is commonly by layers.

The laying is performed on the young branches in ſpring. Give plenty of water all ſummer, and they will ſometimes be rooted and fit for potting off in autumn; but ſometimes they require two ſummers to be rooted effectually: when, however, they are properly rooted, take them off early in autumn, and pot them ſeparately: give water, and place them in the ſhade till they have taken freſh root; and in October remove them into the green-houſe, &c.

Thoſe you intend to plant in the open ground, as before ſuggeſted, ſhould be kept in pots, in order to have occaſional ſhelter of a garden frame two or three years, till they have acquired ſome ſize, and are hardened to the full air; then tranſplant them into a warm border againſt a wall: mulch their roots in winter, and mat their tops in froſty weather.

Olives have an acrid, bitter, extremely diſagreeable taſte: pickled (as we receive them from abroad) they prove leſs diſagreeable. The Lucca olives, which are ſmaller than the others, have the weakeſt taſte; the Spaniſh, or larger, the ſtrongeſt; the Provence, which are of a middling ſize, are generally the moſt eſteemed.

When olives are intended for preſervation, they are gathered before they are ripe. The art of preparing them conſiſts in removing their bitterneſs, in preſerving them green, and in impregnating them with a brine of aromatized ſea ſalt, which gives them an agreeable taſte. For this purpoſe different methods are employed. Formerly they uſed a mixture of a pound of quicklime, with ſix pounds of newly ſifted wood aſhes; but of late, inſtead of the aſhes, they employ nothing but a lye. This, it is alleged, ſoftens the olives, makes them more agreeable to the taſte, and leſs hurtful to the conſtitution. In ſome parts of Provence, after the olives have lain ſome time in the brine, they remove them, take out the kernel, and put a caper in its place. Theſe olives they preſerve in excellent oil; and when thus prepared, they ſtrongly ſtimulate the appetite in winter. Olives perfectly ripe are ſoft and of a dark red colour. They are then eaten without any preparation, excepting only a ſeaſoning of pepper, ſalt, and oil; for they are extremely tart, bitter, and corroſive.

The oil is undoubtedly that part of the produce of olive trees which is of greateſt value. The quality of it depends on the nature of the ſoil where the trees grow, on the kind of olive from which it is expreſſed, on the care which is taken in the gathering and preſſing of the fruit, and likewiſe on the ſeparation of the part to be extracted. Unripe olives give an intolerable bitterneſs to the oil; when they are over ripe, the oil has an unguinous taſte: it is therefore of importance to chooſe the true point of maturity. When the ſituation is favourable, thoſe ſpecies of olives are cultivated which yield fine oils; otherwiſe, they cultivate ſuch ſpecies of trees as bear a great quantity of fruit, and they extract oil from it, for the uſe of ſoaperies, and for lamps.

They gather the olives about the months of November or December. It is beſt to put them as ſoon as poſſible into baſkets, or into bags made of wool or hair, and to preſs them immediately, in order to extract a fine oil. Thoſe who make oil only for ſoaperies, let them remain in heaps for ſome time in their ſtore houſes; when afterwards preſſed, they yield a much greater quantity of oil. Thoſe even who extract oil to be uſed in food, ſometimes allow them to ferment in heaps, that they may have more oil; but this is extremely hurtful to the quality of the oil, and is the reaſon why fine oil is ſo very rare. M. Duhamel recommends not to mix ſound olives with thoſe in which a fermentation has already begun, and ſtill leſs with ſuch as are putrified: in both caſes, the oil which is extracted is of a bad quality, and unfit for preſervation. In order to have the oil in its purity, we muſt allow it to depoſite its ſediment, and then pour it off into another veſſel. The oil extracted from the pulp only of olives is the moſt perfect which can be obtained, and will keep for ſeveral years; but that which

Olea.

Oleaginous ‖ Olearius.

is extracted from the kernel only, or from the nut, or from the whole olive ground in the common way in public mills, has always more or fewer defects, loſes its limpidity in a certain time, and is very apt to become rancid. Care muſt taken likewiſe to keep the oil in proper veſſels well ſhut. After all, in the courſe of time, olive oil loſes its qualities, becomes diſagreeable to the taſte and ſmell, diminiſhes in fluidity, and at length thickens conſiderably.

The refuſe of the firſt preſſing, when ſqueezed a ſecond time, yields an oil, but thicker and leſs pure than the former. What remains after the ſecond preſſing, when mixed with a little water and placed in a pan over the fire, produces by preſſure a third oil, but of a very inferior quality. What remains after all the oil is expreſſed, is termed *grignon*, and is of no farther uſe but as fuel.

The ſediment, or *fæces*, of new oil, we name after the ancients, *amurca*: it is an excellent remedy in rheumatic affections. In Paris the wax uſed for ſhoes is commonly made of the dregs of defecated oil and ſmoke-black.

Oil of olives is an ingredient in the compoſition of a great many balſams, ointments, plaſters, mollifying and relaxing liniments. It is of an emollient and ſolvent nature; mitigates gripes of the colic, and the pains accompanying dyſentery; and is one the beſt remedies when one has chanced to ſwallow corroſive poiſons; but it by no means prevents the fatal accidents which enſue from the bite of a ſnake, as has been pretended. It is an effectual cure, as M. Bourgeois tells us, for the ſting of waſps, bees, and other inſects. A bandage ſoaked in the oil is immediately applied to the ſting, and a cure is obtained without any inflammation or ſwelling.

Olive oil is of no uſe in painting, becauſe it never dries completely. The beſt ſoap is made of it, mixed with Alicant ſalt-wort and quicklime.

Great drought, as well as much rain, is extremely injurious to the crop of olives. This fruit is much expoſed to the attacks of a worm peculiar to itſelf, and which injures it ſo much, that after the olives are gathered the produce of the oil extracted from them is diminiſhed one half.

The wood of the olive tree is beautifully veined, and has a pretty agreeable ſmell: it is in great eſteem with cabinetmakers, on account of the fine poliſh which it aſſumes. It is of a reſinous nature, and conſequently excellent for burning.

As the laurel branch is the ſymbol of glory, ſo the olive branch covered with leaves has from the moſt ancient times been the emblem of concord, the ſymbol of friendſhip and peace.

The leaves of olive trees have an aſtringent quality. Many people uſe them in making gargles for inflammations of the throat.

Theſe plants in this country muſt be kept principally in pots for moving to the ſhelter of a green-houſe in winter; for they are too tender to proſper well in the open ground in this climate: though ſometimes they are planted againſt a warm ſouth wall, and ſheltered occaſionally from froſt in winter, by mulching the roots, and matting their tops; whereby they may be preſerved, and will ſometimes produce fruit for pickling: a very ſevere winter, however, often kills or greatly injures their young branches; therefore let the principal part be potted in rich earth, and placed among the green-houſe ſhrubs, and managed as others of that kind.

Theſe trees are often ſent over from Italy to the Italian warehouſes in London, along with orange-trees, &c. where pretty large plants may be purchaſed reaſonably, which ſhould be managed as directed for orange trees that are imported from the ſame country. See Citrus.

OLEAGINOUS, ſomething that partakes of the nature of oil, or out of which oil may be expreſſed.

OLEANDER, or rose bay, *nerium*: A genus of the pentandria monogynia claſs. Its characters are theſe: The empalement of the flower is permanent and cut into five acute ſegments; the flower has one funnel-ſhaped petal, cut into five broad obtuſe ſegments, which are oblique; it hath a nectarium, terminating the tube, which is torn into hairy ſegments; it hath five ſhort awl-ſhaped ſtamina within the tube; it hath an oblong germen, which is bifid, with ſcarce any ſtyle, crowned by ſingle ſtigmas; the germen afterwards turns to two long, taper, acute-pointed pods, filled with oblong ſeeds lying over each other like the ſcales of a fiſh, and crowned with down. There are four ſpecies.

Theſe plants are generally propagated by layers in this country; for although they will take root from cuttings, yet that being an uncertain method, the other is generally preferred; and as the plants are very apt to produce ſuckers or ſhoots from their roots, thoſe are beſt adapted for laying; for the old branches will not put out roots: when theſe are laid down, they ſhould be ſlit at a joint, in the ſame manner as is practiſed in laying of carnations. There are few plants which are equal to them either to the ſight or ſmell, for their ſcent is very like that of the flowers of the white thorn; and the bunches of flowers will be very large if the plants are ſtrong.

It is called *nerium* from *νηρος*, "humid," becauſe it grows in humid places. The plant itſelf has a force which is inſuperable; for its juice excites ſo great and violent an inflammation, as immediately to put a ſtop to deglutition; and if it be received into the ſtomach, that part is rendered incapable of retaining any thing; the pernicious drug exerting its force, and purging both upwards and downwards.

Nerium in qualities reſembles the apocynum. See Apocynum. But when handled and examined upon an empty ſtomach, in a cloſe chamber, it cauſes a numbneſs coming by degrees, with a pain in the head; which ſhows that ſomething poiſonous belongs even to the ſmell, though there is no danger if it be received in the open air as may be found upon trial. Antidotes againſt its poiſon are vinegar and all acids.

OLEARIUS (Adam), miniſter to the duke of Holſtein, and ſecretary to the embaſſy ſent in 1633 to the great duke of Muſcovy and to the king of Perſia. He ſpent ſix years in this employment: and, on his return, publiſhed a relation of his journeys, with maps and figures, at Sleſwic, 1656, in folio. He wrote an *Abridgment of the Chronicles of Holſtein from 1448 to 1663*; and was appointed librarian to the duke of Holſtein, in which capacity he probably died. He has the character of an able mathematician, an adept in muſic, and a good orientaliſt, eſpecially in the Perſian language.

Olearius (Godfrey), ſon of Godfrey Olearius, D. D. ſuperintendent of Halle in Saxony, was born there in 1639. He became profeſſor of Greek at Leipſic; and ſhowed his abilities in that language by 52 exercitations on the dominical epiſtles, and upon thoſe parts of the epiſtles in the New Teſtament which are read in the public exerciſes, and which among the Lutherans are the ſubject of part of their ſermons. He diſcharged the moſt important poſts in the univerſity, and among other dignities was ten times rector of it. His learning and induſtry were diſplayed in 106 theological diſputations, 61 in philoſophy, ſome programmas upon difficult points, ſeveral ſpeeches and theological counſels; which make two thick volumes: beſide his Moral Theology, his introduction to Theology, which treats of caſes of conſcience, and his *Hermeneutica Sacra.* He lived to a good old age, dying in 1713. His eldeſt ſon of his own name was a man of genius and learning, a profeſſor in the ſame univerſity, who publiſhed ſeveral works, but died young of a conſumption before his father.

OLECRANUM, or Olecranon, in anatomy, the protuberance of the ulna, which prevents the joint of the elbow from being bent back beyond a certain length. See Anatomy, N° 51.

OLENUS, a Greek poet, older than Orpheus, came from Xanthe, a city of Lycia. He compoſed ſeveral hymns, which were ſung in the iſland of Delos upon feſtival days. Olenus is ſaid to have been one of the founders of the oracle at Delphi; to have been the firſt who filled at that place the office of prieſt of Apollo; and to have given reſponſes in verſe: but the truth of theſe aſſertions is very doubtful.

OLERON, an iſland of France, on the coaſt of Aunis and Saintonge, about five miles from the continent. It is 12 miles in length, and five in breadth; and is very fertile, containing about 12,000 inhabitants, who are excellent ſeamen. It is defended by a caſtle, which is well fortified; and there is a lighthouſe placed there for the direction of ſhips. It is 14 miles ſouth-eaſt of Rochelle. W. Long. 1. 26. N. Lat. 46. 10.

Sea Laws of Oleron, certain laws relative to maritime affairs, made in the time of Richard I. when he was at the iſland of Oleron. Theſe laws, being accounted the moſt excellent ſea laws in the world, and recorded in the black book of the admiralty. See *Selden's Mare Clauſum.*

OLEUM palmæ christi, commonly called *caſtor oil,* is extracted from the kernel of the fruit produced by the *Ricinus Americanus.* (See Ricinus). This oil has been much uſed as a purgative in medicine. It acts gently on the bowels, with little or no irritation. By many phyſicians it has been deemed a ſovereign remedy in bilious, calculous, and nephritic complaints; but its taſte is extremely nauſeous, and, when frequently uſed, it is apt to relax the tone of the bowels. It is recommended to be given in clyſters; and Dr Canvane of Bath affirms, that when children cannot be made to ſwallow any medicine, if the navel and hypochondria be rubbed with this oil, it will produce one or two phyſical ſtools. He adds, that given in ſmall draughts, or by clyſter, or by embrocation, it is an excellent and wonderful vermifuge.

OLFACTORY nerves. See Anatomy, N° 136 and 140.

OLGA, queen of Igor the ſecond monarch of Ruſſia, who flouriſhed about the year 880, having ſucceeded his father Ruric, who died in 878. Olga was born in Pleſcow, and was of the beſt family in that city. She bore him one ſon, called *Swetoſlaw.* Igor being murdered by the Drewenſes, or Drewliani, Olga revenged his death. She went afterwards, for what reaſon we know not, to Conſtantinople, where ſhe was baptized, and received the name of *Helena.*

The emperor John Zimiſces was her godfather, and fell in love with her as we are told; but ſhe, alleging their ſpiritual alliance, refuſed to marry him. Her example made ſome impreſſion upon her ſubjects, a good number of whom became converts to Chriſtianity; but none upon her ſon, who reigned for a long time after her death, which happened at Pereſlaw, in the 80th year of her age, 14 years after her baptiſm. The Ruſſians to this day rank her among their ſaints, and commemorate her feſtival on the 11th of July.

OLIBANUM, in pharmacy, a gummy reſin, the product of the *juniperus lycia* (Lin.), brought from Turkey and the Eaſt Indies, uſually in drops or tears like thoſe of maſtich, but larger; of a pale yellowiſh, and ſometimes reddiſh, colour; a moderately warm pungent taſte, and a ſtrong, not very agreeable ſmell. This drug has received many different appellations, according to its different appearances: the ſingle tears are called ſimply *olibanum* or *thus;* when two are joined together, they have been called *thus maſculum,* and when very large, *thus fœmininum:* ſometimes four or five, about the bigneſs of filberds, are found adhering to a piece of the bark of the tree which they exuded from; theſe have been named *thus corticoſum:* the finer powder which rubs off from the tears in the carriage, *mica thuris;* and the coarſer powder, *manna thuris.* This drug is not however, in any of its ſtates, what is now called *thus* or *frankincenſe* in the ſhops. See the article Thus.

Olibanum conſiſts of about equal parts of a gummy and reſinous ſubſtance; the firſt ſoluble in water, the other in rectified ſpirit. With regard to its virtues, abundance have been attributed to it, particularly in diſorders of the head and breaſt, in hæmoptoes, and in alvine and uterine fluxes: but its real effects in theſe caſes are far from anſwering the promiſes of the recommenders. Riverius is ſaid to have had large experience of the good effects of this drug in pleuriſies, eſpecially epidemic ones: he directs a ſcooped apple to be filled with a dram of olibanum, then covered and roaſted under the aſhes; this is to be taken for a doſe, three ounces of carduus water after it, and the patient covered up warm in bed; in a ſhort time, he ſays, either a plentiful ſweat, or a gentle diarrhœa, enſues, which carry off the diſeaſe. Geoffroy informs us, that he has frequently made uſe of this medicine after veneſection, with good ſucceſs; but acknowledges that it has ſometimes failed.

OLIGÆDRA, in natural hiſtory, the name of a genus of cryſtals compoſed of very few planes, as the name expreſſes. The word is compounded of ολιγος "a few,"

few," and ἑδρα "a plane." The bodies of this claſs are cryſtals of the imperfect kind; being compoſed of columns affixed irregularly to ſome ſolid body at one end, and the other terminated by a pyramid: but the column and pyramid being both pentangular, the whole conſiſts only of ten planes, and not, as the common kind, of 12.

OLIGARCHY, a form of government wherein the adminiſtration of affairs is confined to a few hands.

OLIO, or Oglio, a ſavoury diſh, or food, compoſed of a great variety of ingredients; chiefly found at Spaniſh tables.

The forms of olios are various. To give a notion of this ſtrange aſſemblage, we ſhall here add one from an approved author.

Take rump of beef, neats tongues boiled and dried, and Bologna ſauſages; boil them together, and, after boiling two hours, add mutton, pork, veniſon and bacon, cut in bits; as alſo turnips, carrots, onions, and cabbage, borage, endive, marigolds, ſorrel, and ſpinach; then ſpices, as ſaffron, cloves, mace, nutmeg, &c. This done, in another pot put a turkey or gooſe, with capons, pheaſants, wigeons, and ducks, partridges, teals, and ſtock-doves, ſnipes, quails, and larks, and boil them in water and ſalt. In a third veſſel, prepare a ſauce of white wine, ſtrong broth, butter, bottoms of artichokes, and cheſnuts, with cauliflowers, bread, marrow, yolks of eggs, mace, and ſaffron. Laſtly, Diſh the olio, by firſt laying out the beef and veal, then the veniſon, mutton, tongues, and ſauſages, and the roots over all; then the largeſt fowls, then the ſmalleſt, and laſtly pour on the ſauce.

OLISIPO, (Pliny, Antonine, Inſcriptions); a town of Luſitania, ſituated on the north ſide of the frith of the Tagus; of ſuch antiquity, that Solinus thought it was built by Ulyſſes; and Mela, probably to favour this opinion, writes, according to the common copies, *Ulyſſipo*; both of them perhaps deceived by the ſimilarity of ſound. It was a municipium, with the ſurname *Felicitas Julia*, a privilege granted by the munificence of Auguſtus, (Inſcriptions, Pliny). Now Liſbon, capital of Portugal, ſituated on the north bank of the Tagus, diſtant about ten miles from its mouth. See Lisbon.

OLIVAREZ (Count de), by name *Don Gaſpar de Guzman*, favourite and miniſter to Don Philip IV. of Spain, about 1620; a man of great parts and boundleſs ambition. Philip no ſooner became king, than he became the ſubject of this his favourite. The king had abilities, it is true, but they lay dormant; and whilſt he ſpent his time in liſtleſs inactivity, the whole government was under the direction of Olivarez. The count's management, indeed, was ſufficiently dexterous in accompliſhing his own deſigns; for by the beſt framed excuſes, and on the moſt plauſible pretexts, he removed all ſuch as he thought ſtood in his way; nor did he ſtop there, but ſometimes perſecuted his rivals even to death, of which Don Rodrigo Calderona was a melancholy inſtance, an inſtance which at that time excited univerſal compaſſion. This miniſter, in ſhort, had a genius of no common kind; added to which, he had a diſpoſition which ſpurned all controul.

He had perſecuted the late miniſtry for their puſillanimity in the management of affairs; he therefore thought it neceſſary, and it was certainly prudent, to purſue new meaſures. His ſelf-ſufficiency, though unbounded, was concealed under the veil of aſſumed modeſty, and he was careful to make it appear that he was wholly taken up with the things of his own province. His politics were of a refined perhaps, but not of a very uſeful, tendency; for his imprudence, or his wrong notions on the ſubject, made him renew a war with Holland, contrary to the univerſal opinion of the council and the people. By the ſame imprudence, or by ſomething worſe, he provoked England, and obliged her to endeavour to humble the pride and leſſen the authority of the houſe of Auſtria. Thus far he had been of little ſervice to his country, having only provoked the reſentment of the moſt powerful ſtates, particularly England, France, Holland, &c. to conſpire for its ruin. It is remarkable that Olivarez, notwithſtanding this, never loſt his credit; and indeed things ſo turned about in the end, that though Spain for a whole year was put to the ſevereſt trials, it acquired a degree of fame which ſufficiently, in the general opinion, overbalanced ſome little loſs. Olivarez too was particularly fortunate in making the peace; in which tranſaction he gained a very conſiderable advantage over Richelieu, ſo that things appeared to be ſtill in a very favourable train. Fortune, however, was not always quite ſo indulgent to the ſchemes of this miniſter: he again drew Spain into a war with Mantua, contrary to the ſentiments of the wiſeſt men; from which is juſtly dated its declenſion, if not its ruin.

On the whole, Olivarez ſeems to have been always averſe to peace; and with ſuch a reſtleſs diſpoſition, it is undoubtedly wonderful that he held his place ſo long and with ſo few complaints as he did.

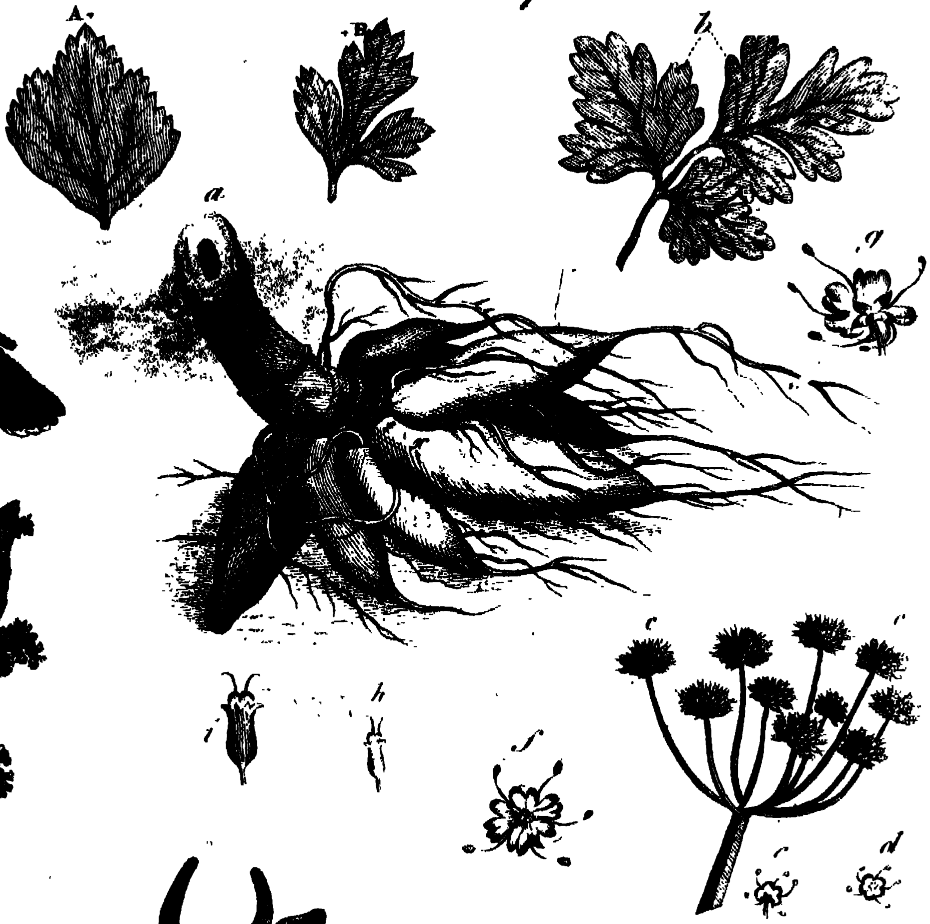
It was certainly owing to his ambition and obſtinacy, that an almoſt general war was excited about the year 1627, and which, as we have ſaid, proved ſo fatal to Spain. So averſe, indeed, does he appear to have been to peace, that he uſed every means in his power to prevent the reſtoration of it in Italy; and for this very purpoſe he ſent Feria into Milan, whom he knew to be a man of ſuch a temper and abilities as ſuited his purpoſes; for he was naturally averſe to quiet. He endeavoured to break the alliances of the duke of Mantua by various ſtratagems; but they did not ſucceed: the ſchemes of Olivarez and the intrigues of Feria being totally defeated. Our miniſter had ſoon after this another cauſe of mortification, on Richelieu's being created a duke and peer of France, and unanimouſly admitted among the Venetian nobility; which could not fail to be a ſevere ſtroke on Olivarez, who conſidered him as his implacable enemy.

The people at length began to ſee and to be diſpleaſed with his conduct; and with reaſon, had they known it all, for it was in many inſtances cruel and deteſtable. Indeed the differences which at that time had ſo long ſubſiſted between France and Spain were the effect of the private animoſity between him and Richelieu. Things, however, ſo turned about, and Spain was ſo unuſually ſucceſsful, that the faults of the miniſter were overlooked for the time; but this unexpected good fortune had no other effect than that of making him

Plate CCCXLVII.

The Nut Cracker.

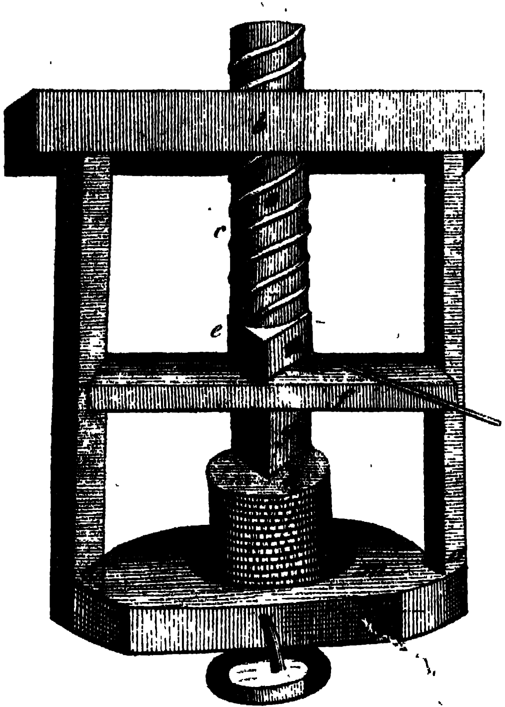
Oenanthe, or Water Drop-wort.



Spotted or Surinam Nuthatch.

Nyl Ghau.

Olive Press.



A. Bell Prin. Wal. Sculptor fecit

him far more inſolent than ever. He was, in every inſtance, one of the moſt headſtrong and obſtinate men in the world: he had ſet his heart on the reduction of Caſal in Italy, and he was determined on it at whatever hazard; this fooliſh enterpriſe was, however, unaccountably defeated, and the Spaniſh army experienced a total defeat.

The revolt of the Catalans, whom he wiſhed to deprive of their privileges, was the next conſequence of his folly? he had privately employed the Marquis de los Velez to extinguiſh this rebellion; but the cruelty of the meaſures uſed for this purpoſe only inflamed it the more. The revolution of Portugal, another diſaſtrous event, was alſo the reſult of his obſtinacy and rigour.

This ſeries of ill fortune, which ought to have opened the eyes of the Catholic king and his miniſters, ſeemed to infatuate both. The great ſecret by which Olivarez had governed his maſter was being the companion, or at leaſt the confidant, of his pleaſures. While he affected to deceive the world with a ſpecious appearance of religion and piety, he was not only immerſed in vice himſelf, but encouraged and promoted it in his prince, to the ſcandal of his ſubjects, and the prejudice of his affairs. At this time, of all others the moſt improper, Olivarez produced a baſtard of his, hitherto called *Julian;* he had taken ſo little care of this ſon, that, not able to ſubſiſt in Spain he had paſſed over to the Indies, where, in very mean ſtations, he had ſcarce got bread. On him he now beſtowed the name of *Don Henrico de Guzman;* and bringing him with great pomp and ſplendour to court, either flattered or forced the conſtable of Caſtile to give him his daughter; in conſideration of which alliance he was to devolve upon him his duchy of St Lucar. In the beginning of his adminiſtration, by ſome accident or other, he preſented to the king a memorial, in relation to an affair upon which his majeſty had already received one from Don Balthaſar de Zuniga: upon comparing them, they contradicted each other flatly. The king ordered a a perſon of great quality to inquire thoroughly into this buſineſs; in conſequence of which Don Balthaſar's memorial appeared to be the truth, and that of Olivarez the reverſe of it. The king was very angry; but the count regained his favour, by procuring for him the fair actreſs Calderona. By this woman he had a ſon, of whom no great notice was taken; but now, to obſcure the folly of the count duke, this youth, ſcarce in the 14th year of his age, was produced, with the title of *Don Juan of Auſtria,* and declared generaliſſimo of the army againſt Portugal; while the heir apparent to the crown, Don Balthaſar, was left under the tuition, or rather in the cuſtody of the counteſs of Olivarez; at which conduct the queen was chagrined, the people enraged, and the world in general aſtoniſhed.

His ſchemes now began to be entirely broken and defeated everywhere and in every kind; he fell under the diſpleaſure of the queen, the emperor, the grandees, and the people all at once, and experienced the diſgrace he had long merited. His ill fortune, which came upon him with the force of a torrent, did not, however, wholly overpower him; he was indeed obliged to conceal himſelf, in order to avoid the rage of the populace: but he had ſtill confidence enough to offer an apology for his conduct, which poſſeſſed no inconſiderable ſhare of wit and humour, well tempered with ſpirit and maſterly reaſoning. It was not, however, of any conſequence to him; for he was baniſhed to Toro, where, worn out by infirmities, or overcome by deſpair, he ended his days about the year 1645.

OLIVE, in botany. See OLEA.

Plate CCCXLVII.

Olive Preſs. In order to obtain the olive oil, the olives are firſt bruiſed in a rough trough, under a millſtone, rolling perpendicularly over them; and when ſufficiently maſhed, put into the maye or trough, *m,* of an olive preſs, where *aa* are the upright beams, or cheeks; *b,* the female, and *c,* the male ſcrew; *f,* the board on which the ſcrew preſſes; *g,* a cubical piece of wood, called a *block; h,* the peel, a circular board, to be put under the block. By turning the ſcrew, all the liquor is preſſed out of the maſhed olives, and is called *virgin oil;* after which, hot water being poured upon the remainder in the preſs, a coarſer oil is obtained. Olive oil keeps only about a year, after which it degenerates.

Olive Colour, a yellow mingled with black.

OLIVE (Peter John), was born in France, and died in 1297, in the fiftieth year of his age. In his youth he wrote a book in praiſe of the Virgin Mary, which was condemned during the pontificate of Nicholas III. as containing ſome things too extravagant. He afterwards was frequently accuſed by the brothers of his order, whoſe reſentment he had drawn upon himſelf by his ſevere reproofs of their luxury, and his endeavours to recal them to the poverty and rigour of their firſt inſtitution. After his death his body was dug up, he was condemned as a heretic, and his writings were burnt, and remained prohibited till the time of Sixtus IV. who having ordered them to be examined, declared they contained nothing expreſsly contrary to the Catholic faith. The propoſitions condemned by John are mentioned by Emmericus, in his Directory of the Inquiſition, under twenty-two heads. The chief of them are, "That the Pope was the myſtical Antichriſt; that St Francis was the angel in the Revelation ſaid to have the mark of the living God, and that his rule was the true goſpel; that the perfect ſtate of the church began with St Francis; and that Chriſt and his apoſtles had no property, either in common or in particular, but only the uſufruct of what they enjoyed."

OLIVER (Iſaac), an excellent Engliſh painter, born in 1556, eminent both for hiſtory and portraits. Several fine miniatures of this maſter are to be ſeen in the collections of our nobility and gentry; ſome of them portraits of himſelf. As he was a very good deſigner, his drawings are finiſhed in an extraordinary degree of perfection; many being copies after Parmegiano. Rubens and Vandyck painted James I. after a miniature of Oliver's, which is a ſufficient teſtimony of his merit. He died in 1617.

OLIVER (Peter), the ſon and diſciple of Iſaac Oliver, was born in 1601. He arrived at a degree of perfection in miniature portaits confeſſedly ſuperior to his father, or any of his cotemporaries, as he did not confine his ſubjects to a head only. In the collections of Charles I. and James II. there were 13 hiſtorical ſubjects painted by this Oliver; of which ſeven are ſtill preſerved in the cloſet of Queen Caroline at Kenſington; and a capital painting of his wife is in the poſſeſſion of the ducheſs of Portland. He died in 1660.

OLIVET, or *Mount of Olives* (anc. geog.), was ſituated to the eaſt of the city of Jeruſalem, and parted from the city only by the brook Kidron, and by the valley of Jehoſhaphat, which ſtretches out from the north to the ſouth. It was upon this mount that Solomon built temples to the gods of the Ammonites (1 Kings xi. 7.) and of the Moabites, out of complaiſance to his wives, who were natives of theſe nations. Hence it is that the Mount of Olives is called the *mountain of corruption* (2 Kings xxiii. 13.) Joſephus ſays, that this mountain is at the diſtance of five ſtadia, or furlongs, from Jeruſalem, which make 625 geometrical paces, or the length of a Sabbath day's journey, ſays St Luke (Acts i. 12.) The Mount of Olives had three ſummits, or was compoſed of three ſeveral mountains, ranged one after another from north to ſouth. The middle ſummit is that from whence our Saviour aſcended into heaven. It was upon that towards the ſouth that Solomon built temples to his idols. The ſummit which is moſt to the north is diſtant two furlongs from the middlemoſt. This is the higheſt of the three, and is commonly called Galilee.

In the time of King Uzziah, the Mount of Olives was ſo ſhattered by an earthquake, that half of the earth that was on the weſtern ſide fell down, and rolled four furlongs or 500 paces from thence, towards the mountain which was oppoſite to it on the eaſt; ſo that the earth blocked up the highways, and covered the king's gardens.

Mr Maundrell tells us that he and his company going out of Jeruſalem at St Stephen's gate, and croſſing the valley of Jehoſhaphat, began immediately to aſcend the mountain; that being got above two-thirds of the way up, they came to certain grottos cut with intricate windings and caverns under ground, which were called the ſepulchres of the prophets; that a little higher up were twelve arched vaults under ground, ſtanding ſide by ſide, and built in memory of the apoſtles, who are ſaid to have compiled their creed in this place; that ſixty paces higher they came to the place where Chriſt is ſaid to have uttered his prophecy concerning the final deſtruction of Jeruſalem; and a little on the right hand, to another, where he is ſaid to have dictated a ſecond time the Lord's prayer to his diſciples; that ſomewhat higher is the cave of a ſaint called *Pelagia*; a little above that, a pillar denoting the place where an angel gave the Bleſſed Virgin three days warning of her death; and at the top of all, the place of our bleſſed Lord's aſcenſion.

OLIVETAN (Robert), related to the famous Calvin, printed at Neufchatel in 1535, in folio, a verſion of the Bible into French, the firſt which had been tranſlated from the original Hebrew and Greek. It is written in an uncouth and barbarous ſtyle, and is far from being faithful. The characters in which it is printed are Gothic, and the language of it is no leſs ſo. It is valued only becauſe it is rare to be found. Calvin is thought to have had a very conſiderable ſhare in this tranſlation. Olivetan ſurvived his publication but a ſhort time; for he was poiſoned at Rome the year after, of which his tranſlation is alleged to have been the cauſe. Olivetan's Bible, reviſed by John Calvin and N. Malinger, was reprinted at Geneva, in 1540, in quarto. This edition is ſtill rarer than the former. It is called the *Bible de l'Epée*, becauſe the printer had a ſword for his ſign.

OLIVIER (Claude Matthieu), advocate of the parliament of Aix, was born at Marſeilles in 1701, and appeared at the bar with eclat. He had a chief hand in the eſtabliſhment of the academy of Marſeilles, and was one of its original members. He poſſeſſed a quick and lively genius. A few hours retirement from ſociety and from his pleaſures were frequently ſufficient to enable him to ſpeak and write, even on important cauſes; but his works commonly bore marks of haſte. Given to exceſs in every thing, he would employ a fortnight in ſtudying the Code and the Digeſt, or in ſtoring his mind with the beauties of Demoſthenes, Homer, Cicero, or Boſſuet; and then abandon himſelf for another fortnight, frequently a whole month, to a life of frivolity and diſſipation. He died in 1736, at the age of 35. He publiſhed 1. *L'Hiſtoire de Philippe roi de Macedoine, et pere d'Alexandre le Grand*, 2 vols. 12mo. No writer has ſo ably handled the hiſtory of the age of Philip, the intereſts of the different nations of Greece, and their manners and cuſtoms: but the conduct of the work is extremely defective. The digreſſions are too frequent, and often tedious. The ſtyle is in no reſpect ſuitable to a hiſtory. It is in general dry, unconnected, and like the ſtyle of a diſſertation. Sometimes, however, we find in it paſſages full of fire and beauty, and turns of expreſſion truly original. A diſeaſe of the brain, with which he was attacked, and under which he laboured ſeveral years, prevented him from putting his laſt hand to the work. 2. *Mémoire ſur les ſecours donnés aux Romains par les Marſeillois pendant la 2de Guerre Punique.* 3. *Mémoire ſur les ſecours donnés aux Romains par les Marſeillois durant la Guerre contre les Gaulois.*

OLMUTZ, a town of Germany, in Moravia, with a biſhop's ſee, and a famous univerſity. The public buildings are very handſome, particularly the Jeſuits college. It is a populous, trading, and very ſtrong place; and yet it was taken, with the whole garriſon, by the king of Pruſſia in 1741. In July 1758 he beſieged it again; and when he had almoſt taken the place he was obliged to raiſe the ſiege, to go and meet the Ruſſian army. It is ſeated on the river Morave. E. Long. 17. 35. N. Lat. 49. 30.

OLOCENTROS, in natural hiſtory, a name given by the old Greeks to a ſmall animal of the ſpider kind, whoſe bite was accounted mortal. It is the ſame with the ſolipuga, ſo called from its ſtinging, or biting moſt violently, in places, or ſeaſons, where the ſun had the moſt power, as Africa, &c. The name *ſoliſuga* was a corrupt way of writing that word; and this ſeems alſo a falſe way of writing the word *helioccntros*, which ſignifies the ſame as ſolipuga.

OLYMPIA (Maldachini Donna), a woman of a very uncommon character. She flouriſhed about the middle of the laſt century. She was ſiſter-in-law to Pope Innocent X. and had the addreſs to acquire an unlimited power over this vain, weak, and injudicious eccleſiaſtic. Her ſon Camillo was promoted to the cardinalate, under the title of Pamphilio; but falling in love with the Princeſs Roſſana, a beautiful young widow, he laid aſide his hat, and married. The crime, if it was one, was eſteemed by the Romans in general at leaſt venial. The pope, however, was diſpleaſed; and Olympia procured their baniſhment, being afraid leſt her daughter-in-law ſhould leſſen her authority in the *ſacred court.* This authority, equally unnatural and uncommon, reflected neither honour on her who held it, nor on the man who allowed her to hold it. Such elevated ſituations, however, whether they are the reward of merit, the effect of chance, or acquired by cunning, are ſeldom very ſecure. Olympia, who had procured the diſgrace of many who did not deſerve it, and who had herſelf long merited ſuch a fate, at length experienced both diſgrace and baniſhment. This was obtained by means of Cardinal Panzirollo, a great favourite of the pope's. The immediate cauſe of it was this: The pope had determined, in order to leſſen his own trouble, to adopt a nephew, and to make him a *Cardinal Patron,* in order to give audience to ambaſſadors and miniſters, and in his abſence to preſide at the council. For this purpoſe, at the recommendation of his favourite, his holineſs made choice of Aſtalli, brother of the marquis Aſtalli, who had married a niece of Olympia. Olympia indeed was ſlightly conſulted on the affair, and ſhowed no diſapprobation of the appointment. The pope, however, no ſooner got him fixed in his new office, than he ſhowed his own weakneſs by repenting of it. Olympia too was diſpleaſed, and by her ſolicitations procured the diſgrace of Aſtalli, before he had enjoyed either the honours or emoluments of his office. Panzirollo, however, ſoon managed matters ſo as to turn the ſcales: he prevailed on the pope again to countenance and honour Aſtalli; and, what was more, had influence ſufficient to perſuade him to diſgrace Olympia, and to baniſh her the court. She had indeed abuſed her authority in a moſt ſcandalous manner, and had gained ſuch an abſolute aſcendant over the pope, that in every thing his will had been ſubſervient to her dictates.—Her avarice and ambition were unbounded: ſhe diſpoſed of all benefices, which were kept vacant till ſhe fully informed herſelf of their value: ſhe rated an office of 1000 crowns for three years, at one year's revenue, and if for life, at 12 years purchaſe, one half of which ſum ſhe required to be paid in advance: ſhe gave audience upon public affairs, enacted new laws, abrogated thoſe of former popes, and ſat in council with Innocent, with bundles of memorials in her hands. It was generally ſaid that they lived together in a criminal correſpondence, and that ſhe had charmed him by ſome ſecret incantation. In the Proteſtant countries the loves and intrigues of Innocent and Donna Olympia were repreſented upon the ſtage; and ſevere ſarcaſms were daily put into the hands of Paſquin at Rome.—As ſhe had uſurped ſuch an abſolute authority, the new cardinal nephew ſaw the neceſſity of ruining her credit; he therefore ſeconded the endeavours of Panzirollo.—He inſinuated to the pope, that his reputation had ſuffered greatly among the Catholics by her ſcandalous proceedings, and that his nuncios were treated with diſreſpect and contempt at the courts of the emperor, France, and Spain. Upon theſe repreſentations, Innocent at length, but with great reluctance, baniſhed Olympia, and was reconciled to Prince Camillo and the Princeſs Roſſana; though ſome authors affirm that her baniſhment was no more than a political retreat, and that ſhe ſtill in private directed the affairs of the pope. A woman of Olympia's character, however, with ſuch unbounded ambition, ſuch an extravagant luſt for power, and ſuch an ambitious deſire of wealth, and who had once poſſeſſed ſo great an aſcendency over ſuch a man as Innocent, was not to be ſo eaſily put off. She was baniſhed in 1650; but in 1653, ſhe again aſſumed the ſupreme direction of affairs juſt as before her diſgrace. She again accompliſhed the diſgrace of Aſtalli, and procured the promotion of Azzolini to the office of ſecretary of the briefs. In 1654, his holineſs reſigned himſelf entirely into the hands of this aſſuming woman; who, obſerving his infirmities daily increaſing, redoubled her rapacity, diſpoſing of benefices to the higheſt bidders in all parts of Italy. She was again, however, in hazard of being diſplaced by a new favourite, *viz.* the cardinal de Retz; and had not the pope's diſſolution prevented it, it would in all probability quickly have taken place. During his laſt illneſs he received nothing but from the hands of Donna Olympia, who was at great pains to prolong his life, watched continually at his bed ſide, and prevented the ambaſſadors or others from diſturbing him with diſcourſes upon buſineſs. She is ſaid, during the laſt ten days of his life, when he continued without the uſe of reaſon, to have amaſſed about half a million of crowns. She did not find the ſucceeding pope (Alexander VII.) ſo eaſy to be played upon as his weak predeceſſor: a number of memorials were ſent in againſt her, and his holineſs was well diſpoſed to attend to them: he ordered her to retire from Rome, and at the ſame time began to examine witneſſes reſpecting her conduct. She was cut off, however, before the trial was finiſhed, by the plague, which, in 1636, afflicted Rome and its neighbourhood. Her eſtate was not confiſcated as was generally expected; and the prince Pamphilio was allowed to ſucceed her. The pope only reſerved for his own relations about a million of crowns.

Olympia (anc. geog.), with the ſurname *Piſatis* (Strabo); ſo called from the territory of Piſa in Elis; deſcribed by Strabo, "as the temple of Jupiter Olympius, before which ſtands a grove of wild olive trees, in which is the ſtadium, or foot-courſe, ſo called becauſe the eighth part of a mile; and by which the Alpheus, coming down from Arcadia, runs." Olympia, however, was famous not merely for the temple of Jupiter, but alſo for a temple of Juno, 63 feet long, with columns round it of the Doric order; and a Metroum or temple of the mother of the gods, a large Doric edifice; with holy treaſuries. Theſe, and the porticoes, a gymnaſium, prytaneum, and many more buildings, chiefly in the encloſure, with the houſes of the prieſts and other inhabitants, made Olympia no inconſiderable place. The ſtadium was in the grove of wild olive trees, before the great temple; and near it was the hippodrome or courſe for the races of horſes and chariots. The Alpheus flowed by from Arcadia with a copious and very pleaſant ſtream, which was received on the coaſt by the Sicilian ſea.

The temple of Jupiter was of the Doric order, 68 feet high to the pediment, 95 wide, and 230 long; the cell encompaſſed with columns. It was erected with the country ſtone; the roof not of earth baked, but of Pentelic marble; the ſlabs diſpoſed as tiles; the way to it up a winding ſtaircaſe. The two pediments were enriched with ſculpture; and one had over the centre a ſtatue of Victory gilded; and underneath a votive buckler of gold. At each corner was a gilded vaſe. Above the columns were fixed 21 gilded bucklers, offered at the concluſion of the Achæan war by the Roman general Mummius. The gates in the two fronts were of braſs, and over them were carved the labours of Hercules. Within the cell were double colonnades, between which was the approach to the image.

The Jupiter of Olympia was accounted alone ſufficient to immortalize its maker, Phidias. It was of ivory and gold, the head crowned with olive. In the right hand was a ſtatue of Victory; in the left a flowered ſceptre, compoſed of various metals, on which was an eagle. The ſandals were of gold, as alſo the veſtment, which was curiouſly emboſſed with lilies and animals. The throne was gold inlaid with ebony and ivory, and ſtudded with jewels, intermixed with paintings and exquiſite figures in relievo. The pillars between the feet contributed to its ſupport. Before it were walls, ſerving as a fence, decorated principally with the exploits of Hercules; the portion oppoſite to the door of a blue colour. It was the office of a family deſcended from Phidias, called *phædruntæ* or *the poliſhers*, to keep the work bright and clean. The veil or curtain was cloth rich with the purple dye of Phœnicia and with Aſſyrian embroidery, an offering of King Antiochus, and was let down from above by looſening the ſtrings. The image impreſſed on the ſpectator an opinion that it was higher and wider than it meaſured. Its magnitude was ſuch, that though the temple was very large, the artiſt ſeemed to have erred in the proportions. The god, ſitting, nearly touched the ceiling with his head; ſuggeſting an idea, that if he were to riſe up, he would deſtroy the roof. A part of the pavement before it was of black marble, encloſed in a rim of Parian or white, where they poured oil to preſerve the ivory.

The altar of Jupiter Olympius was of great antiquity, and compoſed of aſhes from the thighs of the victims, which were carried up and conſumed on the top with wood of the white poplar tree. The aſhes alſo of the prytaneum, in which a perpetual fire was kept on a hearth, were removed annually on a fixed day, and ſpread on it, being firſt mingled with water from the Alpheus. The cement, it was affirmed, could be made with that fluid only; and therefore this river was much reſpected, and eſteemed the moſt friendly of any to the god. On each ſide of the altar were ſtone ſteps. Its height was 22 feet. Girls and women, when allowed to be at Olympia, were ſuffered to aſcend the baſement, which was 125 feet in circumference. The people of Elis ſacrificed daily, and private perſons as often as they choſe.

Religion flouriſhed at Olympia, and many deities were worſhipped beſides Jupiter. Pauſanias has enumerated above 60 altars of various ſhapes and kinds. One of the unknown gods ſtood by the great altar. The people of Elis offered on all theſe monthly; laying on them boughs of olive; burning incenſe, and wheat mixed with honey; and pouring libations of ſuch liquors as the ritual preſcribed. At the latter ceremony ſometimes a form of prayer was uſed, and they ſung hymns compoſed in the Doric dialect.

Olympia was ſituated on an eminence, between two mountains called *Oſſa* and *Olympus*. Though its ancient ſplendour is gone, the place reminds the traveller of of what it once was. It is in the Morea, being now a ſmall place called *Longinico*, 50 miles ſouth of Lepanto, in E. Long. 22. 0. N. Lat. 37. 40.

OLYMPIAD, the ſpace of four years, whereby the Greeks reckoned time.—The firſt Olympiad fell, according to the accurate and learned computation of ſome of the moderns, exactly 776 years before the firſt year of Chriſt, or 775 before the year of his birth, in the year of the Julian period 3938, and 22 years before the building of the city of Rome. The games were exhibited at the time of the full moon next after the ſummer ſolſtice; therefore the Olympiads were of unequal length, becauſe the time of the full moon differs 11 days every year, and for that reaſon they ſometimes began the next day after the ſolſtice, and at other times four weeks after. The computation by Olympiads ceaſed, as ſome ſuppoſe, after the 364th, in the year 440 of the Chriſtian era. It was univerſally adopted not only by the Greeks, but by many of the neighbouring countries; though ſtill the Pythian games ſerved as an epoch to the people of Delphi and to the Bœotians; the Nemæan games to the Argives and Arcadians; and the Iſthmian to the Corinthians and the inhabitants of the Peloponneſian iſthmus. To the Olympiads hiſtory is much indebted. They have ſerved to fix the time of many momentous events; and indeed before this method of computing time was obſerved, every page of hiſtory is moſtly fabulous, and filled with obſcurity and contradiction, and no true chronological account can be properly eſtabliſhed and maintained with certainty.

OLYMPIAS, a celebrated woman, who was daughter of a king of Epirus, and who married Philip king of Macedonia, by whom ſhe had Alexander the Great. Her haughtineſs, and more probably her infidelity, obliged Philip to repudiate her, and to marry Cleopatra, the niece of King Attalus. Olympias was ſenſible of this injury, and Alexander ſhowed his diſapprobation of his father's meaſures, by retiring from the court to his mother. The murder of Philip, which ſoon followed this diſgrace, and which ſome have attributed to the intrigues of Olympias, was productive of the greateſt extravagances. The queen paid the greateſt honour to her huſband's murderer. She gathered his mangled limbs, placed a crown of gold on his head, and laid his aſhes near thoſe of Philip. The adminiſtration of Alexander, who had ſucceeded his father, was in ſome inſtances offenſive to Olympias; but when the ambition of her ſon was concerned, ſhe did not ſcruple to declare publicly that Alexander was not the ſon of Philip, but that he was the offspring of an enormous ſerpent who had ſupernaturally introduced himſelf into her bed. When Alexander was dead, Olympias ſeized the government of Macedonia; and, to eſtabliſh her uſurpation, ſhe cruelly put to death Aridæus, with his wife Eurydice, as alſo Nicanor the brother of Caſſander, with 100 leading men of Macedon, who were inimical to her intereſt. Such barbarities did not long remain unpuniſhed: Caſſander beſieged her in Pydna, where ſhe had retired with the remains of her family, and ſhe was obliged to ſurrender after an obſtinate ſiege. The conqueror ordered her to be accuſed, and to be put to death. A body of 200 ſoldiers were ordered to put the bloody commands into execution, but the ſplendour and majeſty of the queen diſarmed their courage; and ſhe was at laſt maſſacred by thoſe whom ſhe had cruelly deprived of their children, about 316 years before the Chriſtian era.

OLYMPIC GAMES, were ſolemn games among the ancient Greeks, ſo called from Olympian Jupiter, to whom they were dedicated; and by ſome ſaid to be firſt inſtituted by him, after his victory over the ſons of Titan; others aſcribe their inſtitution to Hercules, not the ſon of Alcmena, but one of much greater antiquity; others to Pelops; and others to Hercules the ſon of Alcmena. By whomſoever they were inſtituted, we know that, at a period rather early, they had fallen into diſuſe. The wars which prevailed among the Greeks, for a while, totally interrupted the religious ceremonies and exhibitions with which they had been accuſtomed to honour the common gods and heroes; but the Olympic games were reſtored on the following occaſion. Amidſt the calamities which afflicted or threatened Peloponneſus, Iphitus, a deſcendant of Oxylus, to whom the province of Eleia * had fallen in the general partition of the peninſula, applied to the Delphic oracle. The prieſts of Apollo, ever diſpoſed to favour the views of kings and legiſlators, anſwered agreeably to his wiſh, that the feſtivals anciently celebrated at Olympia, on the Alpheus, muſt be renewed, and an armiſtice proclaimed for all the ſtates willing to partake of them, and deſirous to avert the vengeance of heaven. Fortified by this authority, and aſſiſted by the advice of Lycurgus, Iphitus took meaſures, not only for reſtoring the Olympic ſolemnity, but for rendering it perpetual. The injunction of the oracle was ſpeedily diffuſed through the remoteſt parts of Greece by the numerous votaries who frequented the ſacred ſhrine. The armiſtice was proclaimed in Peloponneſus, and preparations were made in Eleia for exhibiting ſhows and performing ſacrifices. In the heroic ages, feats of bodily ſtrength and addreſs were deſtined to the honour of deceaſed warriors; hymns and ſacrifices were reſerved for the gods: but the flexible texture of Grecian ſuperſtition, eaſily confounding the expreſſions of reſpectful gratitude and pious veneration, enabled Iphitus to unite both in his new inſtitution.

The feſtival, which laſted five days, began and ended with a ſacrifice to Olympian Jove. The intermediate time was chiefly filled up by the gymnaſtic exerciſes, in which all freemen of Grecian extraction were invited to contend, provided they had been born in lawful wedlock, and had lived untainted by any infamous immoral ſtain. The preparation for this part of the entertainment was made in the gymnaſium of Elis, a ſpacious edifice, ſurrounded by a double range of pillars, with an open area in the middle. Adjoining were various apartments, containing baths, and other conveniences for the combatants. The neighbouring country was gradually adorned with porticoes, ſhady walks and groves, interſperſed with ſeats and benches; the whole originally deſtined to relieve the fatigues and anxiety of the candidates for Olympic fame; and frequented in later times, by ſophiſts and philoſophers, who were fond to contemplate wiſdom, and communicate knowledge, in thoſe delightful retreats. The order of the athletic exerciſes, or combats, was eſtabliſhed by Lycurgus, and correſponded almoſt exactly to that deſcribed by Homer, in the 23d book of the Iliad, and eighth of the Odyſſey. Iphitus, we are told, appointed the other ceremonies and entertainments; ſettled the regular return of the feſtival at the end of every fourth year, in the month of July; and gave to the whole ſolemnity that form and arrangement, which it preſerved with little variation above a thouſand years; a period exceeding the duration of the moſt famous kingdoms and republics of antiquity. Among the benefactors of Olympia, at a much later period, was reckoned Herod, who was afterwards king of Judæa. Seeing, on his way to Rome, the games neglected or dwindling into inſignificance from the poverty of the Eleans, he diſplayed vaſt munificence as preſident, and provided an ample revenue for their future ſupport and dignity.

The care and management of the Olympics belonged for the moſt part to the Eleans; who on that account enjoyed their poſſeſſions without moleſtation, or fear of war or violence. They appointed a certain number of judges, who were to take care that thoſe who offered themſelves as competitors ſhould perform their preparatory exerciſes; and theſe judges, during the ſolemnity, ſat naked, having before them a crown of victory, formed of wild olive, which was preſented to whomſoever they adjudged it. Thoſe who were conquerors were called *Olympionices*, and were loaded with honours by their countrymen. At theſe games women were not allowed to be preſent; and if any woman was found, during the ſolemnity, to have paſſed the river Alpheus, ſhe was to be thrown headlong from a rock. This, however, was ſometimes neglected; for we find not only women preſent at the celebration, but alſo ſome among the combatants, and ſome rewarded with the crown. The preparations for theſe feſtivals were great. No perſon was permitted to enter the liſts, if he had not regularly exerciſed himſelf ten months before the celebration at the public gymnaſium of Elis. No unfair dealings were allowed; whoever attempted to bribe his adverſary was ſubjected to a ſevere fine; and even the father and relations were obliged to ſwear that they would have recourſe to no artifice which might decide the victory in favour of their friends. No criminals, nor ſuch as were connected with impious and guilty perſons, were ſuffered to preſent themſelves as combatants. The wreſtlers were appointed by lot. Some little balls ſuperſcribed with a letter were thrown into a ſilver urn, and ſuch as drew the ſame letter were obliged to contend one with the other. He who had an odd letter remained the laſt; and he often had the advantage, as he was to encounter the laſt who had obtained the ſuperiority over his adverſary. In theſe games were exhibited running, leaping, wreſtling, boxing, and the throwing of the quoit, which was called altogether *πενταθλον*, or *quinquertium*. Beſides theſe, there were horſe and chariot races, and alſo contentions in poetry, eloquence, and the fine arts. The only reward that the conqueror obtained was a crown of olive. This, as ſome ſuppoſe, was in memory of the labours of Hercules, which were accompliſhed for the univerſal good of mankind, and for which the hero claimed no other reward but the conſciouſneſs of having been the friend of mankind. So ſmall and trifling a reward ſtimulated courage and virtue, and was the ſource of greater

* *Gillies Hiſtory of Greece.*

greater honours than the moſt unbounded treaſures. The ſtatues of the conquerors, called *Olympionicæ*, were erected at Olympia in the ſacred wood of Jupiter.

Their return home was that of a warlike conqueror; they were drawn in a chariot by four horſes, and everywhere received with the greateſt acclamations. Their entrance into their native city was not through the gates; to make it more grand and more ſolemn, a breach was made in the walls. Painters and poets were employed in celebrating their names; and indeed the victories ſeverally obtained at Olympia are the ſubjects of the moſt beautiful odes of Pindar. The combatants were naked. A ſcarf was originally tied round their waiſt; but when it had entangled one of the adverſaries, and been the cauſe that he loſt the victory, it was laid aſide, and no regard was paid to decency. The Olympic games were obſerved every fifth year, or, to ſpeak with greater exactneſs, after a revolution of four years, and in the firſt month of the fifth year, and they continued for five ſucceſſive days. As they were the moſt ancient and moſt ſolemn of all the feſtivals of the Greeks, it will not appear wonderful, that they drew ſo many people, not only inhabitants of Greece, but of the neighbouring iſlands and countries.

Such is the account of Grecian writers, who have, doubtleſs, often aſcribed to poſitive inſtitution many inventions and uſages naturally reſulting from the progreſſive manners of ſociety. When we come to examine the Elean games in their more improved ſtate, together with the innumerable imitations of them in other provinces of Greece, there will occur reaſons for believing, that many regulations, referred by an eaſy ſolution to the legiſlative wiſdom of Iphitus or Lycurgus, were introduced by time or accident, continued through cuſtom, improved by repeated trials, and confirmed by a ſenſe of their utility †. Yet ſuch an inſtitution as the Olympiad, even in its leaſt perfect form, muſt have been attended with manifeſt advantages to ſociety. It is ſufficient barely to mention the ſuſpenſion of hoſtilities which took place, not only during the celebration of the feſtival, but a conſiderable time both before and after it. Conſidered as a religious ceremony, at which the whole Grecian name was invited, and even enjoined, to aſſiſt, it was well adapted to facilitate intercourſe, to promote knowledge, to ſoften prejudice, and to haſten the progreſs of civilization and humanity. Greece, and particularly Peloponneſus, was the centre from which the adventurous ſpirit of its inhabitants had diffuſed innumerable colonies through the ſurrounding nations. To theſe widely ſeparated communities, which, notwithſtanding their common origin, ſeemed to have loſt all connexion and correſpondence, the Olympiad ſerved as a common bond of alliance and point of re-union. The celebrity of this feſtival continually attracted to it the characters moſt diſtinguiſhed for genius and enterpriſe, whoſe fame would have otherwiſe been unknown and loſt in the boundleſs extent of Grecian territory. The remote inhabitants, not only of European Greece, but of Aſia and Africa, being aſſembled to the worſhip of common gods, were formed to the ſenſe of a general intereſt, and excited to the purſuit of national honour and proſperity. Strangers of ſimilar diſpoſitions might confirm in Elis the ſacred and indiſſoluble ties of hoſpitality. If their communities were endangered by any barbarous power, they might here ſolicit aſſiſtance from their Grecian brethren. On other occaſions they might explain the benefits which, in peace or war, their reſpective countries were beſt qualified to communicate. And the Olympic feſtival might thus ſerve the purpoſe of reſident ambaſſadors, and other inſtitutions alike unknown to antiquity.

OLYMPUS, the name of ſeveral mountains.—One bounding Bithynia on the ſouth.—Another in the iſland of Cyprus, on whoſe top was a temple of Venus, which women were not permitted either to enter or to ſee (Strabo.)—A third, Olympus of Galatia (Livy). —A fourth, of Lycia, with a noble cognominal town, near the ſea coaſt (Strabo, Cicero), extinct in Pliny's time, there remaining only a citadel: the town was deſtroyed by P. Servilius Iſauricus (Florus), having been the retreat of pirates. From this mountain there was an extenſive proſpect of Lycia, Pamphilia, and Piſidia (Strabo).—A fifth, Olympus of Myſia (Ptolemy); thence ſurnamed *Olympena*, anciently *Minor*; one of the higheſt mountains, and ſurnamed *Myſius* (Theophraſtus;) ſituated on the Propontis, and thence extending more inland.—A ſixth, on the north of Theſſaly, or on the confines of Macedonia; famous for the fable of the giants (Virgil, Horace, Seneca); reckoned the higheſt in the whole world, and to exceed the flight of birds (Apuleius), which is the reaſon of its being called *heaven*, than which nothing is higher: the ſerenity and calmneſs which reign there are celebrated by Homer, Lucan, and Claudian.

OLYRA, in botany: A genus of the triandria order, belonging to the monœcia claſs of plants; and in the natural method ranking under the 4th order, *Gramina*. The male calyx is a biflorous and ariſtated glume; the corolla a beardleſs glume; the female calyx is an uniflorous, patulous, and ovate glume; the ſtyle is bifid, and the ſeed cartilaginous.

OMAR (Ebn Al Khattab) ſucceſſor of Abu Becr. —The Mohammedan impoſture, like every other falſehood of its kind, copies after the truth as far as was thought convenient or proper; and miracles being the grand proof of revelation, it was to be expected that all pretences to that ſhould aſſume at leaſt the appearances of them. Few ſyſtems of faith are more abſurd than Mohammed's; yet, though he diſclaimed miracles, it was ſupported, as we are told by latter writers, by a variety of them, which, however, unfortunately for the creed they were contrived to ſupport, are too trifling, abſurd, and contradictory, to deſerve the ſmalleſt attention.

They tell us, but upon grounds too vague and indeterminate to command belief, that Omar was miraculouſly converted to this faith: a man he is reported to have been, before this event, truly reſpectable, and in particularly a violent oppoſer of the Arabian prophet. Mohammed, it ſeems, felt this oppoſition, and regretted it; he therefore, with the fervour, and, as it happened, with the ſucceſs of a true prophet, according to his followers account, prayed for the converſion of this his dangerous antagoniſt. Omar, it is ſaid, had no ſooner read the 20th chapter of the Koran than he was convinced: upon which he inſtantly repaired to Mohammed and his followers, and declared his converſion. It is ſaid, that at one time he intended to murder

† Gillies's Hiſtory of Greece.

murder the prophet; and various cauſes are aſſigned for the prevention of this ſhocking piece of ſacrilege. After his wonderful converſion, the Mohammedan writers inform us that he was ſurnamed *Al Faruk*, or the "divider;" becauſe, ſay they, when a certain Moſlem was condemned by Mohammed for his iniquitous treatment of a Jew, and appealed afterwards from the ſentence of the prophet to Omar, he cut him in two with his ſcimitar, for not acquieſcing in the deciſion of ſo upright a judge: which circumſtance when Mohammed heard, he gave him the ſurname of *Al Faruk*, or "the divider;" becauſe, by this action, he had ſhown himſelf capable of perfectly diſtinguiſhing between truth and falſehood. Al Kodai affirms, that 39 of Omar's adherents followed his example the ſame day he profeſſed himſelf a votary of Mohammed. The converſion of Hamza and Omar Ebn Al Khattab happened in the year preceding the firſt flight of the Moſlems into Ethiopia, or the fourth year of Mohammed's miſſion, according to Abulfeda. He was unqueſtionably a great acquiſition to the prophet, and enabled him to carry on his ſchemes to far more purpoſe than he could poſſibly have done without him, or if he had continued his enemy. Omar at length found his ſervices in the cauſe he had undertaken ſufficiently honoured and amply rewarded; for on the death of Abu Beer, who had ſucceeded the Impoſtor himſelf, he was promoted to the regal and pontifical dignity. The title firſt aſſigned him was the *caliph of the caliph of the apoſtle of God;* or in other words *the ſucceſſor of the ſucceſſor of Mohammed:* but the Arabs conſidering that this title, by the addition to be annexed to it at the acceſſion of every future caliph, would be too long, they, by univerſal conſent, ſaluted him *the emperor of the believers;* which illuſtrious title, at this juncture conferred on Omar, deſcended afterwards to all the ſucceſſors of that prince. Our readers will not expect us to follow the caliph with minute exactneſs through the tranſactions of his reign. This would indeed ſwell our article beyond all proportion. We ſhall therefore confine ourſelves to ſome of the leading facts.

His arms appear to have been particularly ſucceſsful; the Perſians he conquered, and Jeruſalem ſubmitted to his power; nor does he appear to have been checked in a ſingle inſtance. In conſequence, however, of his ſucceſs, an attempt was made to aſſaſſinate him. The fact is thus related: Wathek Ebn Moſafer, a reſolute young Arab, was procured by the king of Ghaſſan, and ſent to Medina for this very purpoſe. Some time after his arrival, obſerving Omar to fall aſleep under a tree on which he had placed himſelf, ſo as not to be diſcovered by any perſon, he drew his dagger, and was upon the point of ſtabbing him, when, lifting up his eyes, he ſaw a lion walking round about him, and licking his feet. Nor did the lion ceaſe to guard the caliph till he awoke; but then inſtantly went away. This phenomenon ſtruck Wathek with a profound reverence for Omar, whom he now revered as the peculiar care of heaven. He therefore came down from the tree, on which the lion had forced him to remain, kiſſed the caliph's hand, confeſſed his crime, and embraced the Mohammedan religion; being ſo ſtrongly affected with the wonderful deliverance he had been an eye witneſs of. His life, however, was at length ended by aſſaſſination; for about two years after the concluſion of the Nohawandian war, in which the Arabs probably ſtill farther extended their conqueſts, though no account of their military operations during that period has reached us, that is, in the 23d year of the Hegira, according to Abu Jaafar Al Tabari, the caliph Omar Ebn Al Khattab was aſſaſſinated by a Perſian ſlave; of which horrid fact the Arab writers have handed down the following particulars: Abu Lulua, a Perſian of the Magian ſect, whoſe name was *Firuz*, one of Al Mogheira Ebn Al Shaabah's ſlaves, was obliged by his maſter to pay daily two dirhems, in conformity to the Mohammedan cuſtom, for the free exerciſe of this religion. Firuz reſenting this treatment, complained of it to the caliph, and deſired that ſome part at leaſt of the tribute exacted of him might be remitted; but this favour being refuſed by Omar, the Perſian threatened his deſtruction; which he ſoon after effected, by ſtabbing him thrice in the belly with a dagger, while he was in the moſque at Medina performing his morning devotions. The Arabs then preſent perceiving that the villain had imbrued his hands in the blood of their ſovereign, immediately ruſhed upon him; but he made ſo deſperate a defence, that he wounded 13 of the aſſailants, and ſeven of them mortally. At laſt one of the caliph's attendants threw his veſt over him, and ſeized him; upon which he ſtabbed himſelf and ſoon after expired. According to Theophanes, this Firuz was an apoſtate or renegade, and conſequently had before embraced the Mohammedan religion: but this aſſertion is by no means probable; becauſe on his becoming a convert to Iſlamiſm, he muſt have been manumitted by his maſter, and on his relapſing into Magiſm, he would have been put to death by the caliph's order: neither of which particulars are conſiſtent with what we find related by the Arab hiſtorians, and even by our Greek chronographer himſelf. Omar languiſhed three days and then died, in the month of Dhu'lhajja, and the 23d year of the Hegira, which began in the year of our Lord 643. Authors are not agreed with regard to the duration of his caliphate. The Arab hiſtorians, whom we are inclined to follow, ſay that he reigned between 10 and 11 years. Theophanes affirms, that he was murdered in the 12th year of his caliphate, and Dionyſius Telmarenſis extends the length of his reign to 12 complete years. Only one of the wounds given him by Firuz was mortal, and that he received under his navel. At his death he was 63 years old; which, as we are told by an Arab author, was the age of Mohammed himſelf, Abu Beer, and Ayeſha, one of the prophet's wives, when they died. When Omar fell in the moſque, Abd'alrahman Ebn Awf, one of Mohammed's firſt converts, ſupplied his place during the remainder of the ſervice; and three days before his death, Sahib Ebn Tarſib, at his command, officiated for him. His body was interred in Ayeſha's apartment, near that of the prophet Mohammed. We are informed by Eutychius, that during his caliphate he performed the pilgrimage to Mecca nine times. His extenſive conqueſts made the Moſlem empire one of the moſt powerful and formidable monarchies in the world. His diſpoſition is repreſented to us, with evident partiality indeed, as one of the beſt poſſible, and his temperance has always been highly extolled.

OMBI, a city of ancient Egypt, afterwards called *Arſinoe* and *Crocodilopolis*, was the capital of one of the nomes into which that country was divided, and is remarkable, in the annals of idolatry, for the hatred of its inhabitants to the religion of their neighbours the citizens of Tentyra.

The genius of paganiſm was ſo complying with reſpect to the objects of religious worſhip, that although each nation, each city, and almoſt every family, had its own tutelar god, we know not a ſingle inſtance, out of Egypt, of one tribe of Pagans perſecuting another for worſhipping gods different from theirs. The Jews and Chriſtians were indeed perſecuted by the Romans, not however for worſhipping the true God, but becauſe, together with him, they would not worſhip Jupiter, Juno, and all the rabble of heathen divinities.

The reaſon of the almoſt univerſal tolerance of idolaters to one another, and of the intolerance of all to the Jews and Chriſtians, is very obvious. Not a ſingle Pagan, a very few philoſophers perhaps excepted, ever thought of paying his adoration to the Supreme and ſelf-exiſtent Being, but to inferior divinities, to whom it was ſuppoſed that the care of particular perſons, families, cities, and nations was conſigned by the God of the univerſe. The conſequence was, that, as no perſon denied the divinity of his neighbour's object of worſhip, an intercommunity of gods was everywhere admitted, and all joined occaſionally in adoring the gods of the various nations. By the Jews and Chriſtians this communion was rejected as in the higheſt degree impious; and it could not well be maintained between the citizens of Ombi and thoſe of Tentyra.

That brutes were worſhipped in Egypt is univerſally known (See POLYTHEISM); and Diodorus the Sicilian informs us, in a paſſage quoted by Euſebius *, that "the cities and nomes of Egypt being at one time prone to rebellion, and to enter into conſpiracies againſt monarchical government, one of their moſt politic kings contrived to introduce into the neighbouring nomes the worſhip of different animals; ſo that while each reverenced the deity which itſelf held ſacred, and deſpiſed that which its neighbours had conſecrated, they could hardly be brought to join cordially in one common deſign to the diſturbance of the government."

In this diſtribution of gods he conferred upon Ombi the *crocodile*, and upon Tentyra the mortal enemy of that monſter, the *ichneumon*. The conſequence of which was, that while the Ombites worſhipped the crocodile, the Tentyrites took every opportunity of ſlaughtering him, inſomuch that, according to Strabo, the very voice of an inhabitant of Tentyra put the crocodile to flight. This, we confeſs, is a very improbable fact; but it is certain that the mutual hatred of thoſe cities, on account of their hoſtile gods, roſe to ſuch a height, that whenever the inhabitants of the one were engaged in the more ſolemn rites of their religion, thoſe of the other were ſure to embrace the opportunity of ſetting fire to their houſes, and rendering them every injury in their power to inflict. And what may, to a ſuperficial thinker, appear extraordinary, though it will excite no wonder in the breaſt of him who has ſtudied mankind, this animoſity continued between the inhabitants of the two cities long after the crocodile and ichneumon had loſt their divinity.

The conduct of the Egyptian monarch was admirably calculated for preventing the nation from combining againſt the government; and it extended its influence over the whole kingdom. Diodorus informs us, that he aſſigned to each nome an animal to worſhip, which was hated, killed, and ſometimes fed upon by the inhabitants of the neighbouring nome; and we know upon higher authority than his, that the Iſraelites could not offer ſacrifices in Egypt, becauſe the bullock was deemed ſacred over the whole country.

OMBRE, a celebrated game at cards, borrowed from the Spaniards, and played by two, by three, or by five perſons, but generally by three. When three play at this game, nine cards are dealt to each party; the whole ombre pack being only 40; becauſe the eights, nines, and tens, are thrown out of the pack. There are two ſorts of counters for ſtakes, the greater and the leſſer; the laſt having the ſame proportion to the other as a penny to a ſhilling: of the greater counters each man ſtakes one for the game; and one of the leſſer for paſſing for the hand, when eldeſt, and for every card taken in. As to the order and value of the cards, the ace of ſpades, called *ſpadillo*, is always the higheſt trump, in whatſoever ſuit the trump be; the *manille*, or black duce, is the ſecond; and the *baſto*, or ace of clubs, is always the third: the next in order is the king, the queen, the knave, the ſeven, the ſix, the five, four, and three. Of the black there are 11 trumps; of the red, 12. The leaſt ſmall cards of the red are always the beſt, and the moſt of the black; except the duce and red ſeven, both of which are called the *manilles*, and are always ſecond when the red is a trump. The red ace, when a trump, enters into the fourth place, and is called *punto*, otherwiſe it is only called an ace. The three principal cards are called *matadores*; which have this privilege, that they are not obliged to attend an inferior trump when it leads; but for want of a ſmall trump, the perſon may renounce trumps, and play any other card; and when theſe are all in the ſame hand, the others pay three of the greater counters a-piece; and with theſe three for a foundation, he may count as many matadores as he has cards in an uninterrupted ſeries of trumps; for all which the others are to pay one counter a-piece. He who hath the firſt hand is called *ombre*, and has his choice of playing the game, of naming the trump, and of taking in as many and as few cards as he pleaſes; and after him the ſecond, &c. But if he does not name the trump before he looks on the cards he has taken in, any other may prevent him, by naming what trump he pleaſes. He that has the firſt hand ſhould neither take in, nor play, unleſs he has at leaſt three ſure tricks in his hand: for, as he wins the game who wins moſt tricks, he that can win five of the nine has a ſure game; which is alſo the caſe if he wins four, and can ſo divide the tricks as that one perſon may win two, and the other three.

If a perſon plays without diſcarding or changing any cards, this is called *playing ſans prendre*; and if another wins more tricks than he, he is ſaid to *win codille*. The over-ſights in the courſe of the game are called which tranſlation [illegible] mly juſt. But how the Aſſyrians could export [illegible] ry from the iſles of Kittim, and faſhion it into [illegible] ches for the Tyrian mariners, is, in my opinion, [illegible] oblem of no eaſy ſolution. The fact is, Aſhurim [illegible] uld be Aſherim, that is, the company of the m[illegible] f Aſher. The tribe of Aſher obtained its inh[illegible] ince in the neighbourhood of Tyre; (ſee Joſh. xi[illegible] 28.) ‘And Hebron, and R[illegible] b, and Hammon [illegible] Canah, unto Zidon the great.’ The companies [illegible] the tribe of the Aſherites then, and not the Aſh[illegible], were the people who manufactured the benche[illegible] queſtion.

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* Prep. Evang. p. 32. Steph. ed.

“ [illegible] that as it may, the ivory of which theſe implemen[illegible] were formed was imported from the iſles of [illegible] im, that is, from Greece and its neighbourhood. [illegible] e iſlands, it is certain, never produced ivory. [illegible] hey muſt therefore have imported it from ſome other country; but no other country, to which the Greeks and their neighbours could have extended their commerce, except the north of Africa, produced that commodity. The concluſion then is, that the maritime ſtates of Aſia Minor, Greece, and probably the Hetruſcans on the weſt coaſt of Italy, carried on a gainful commerce with Spain and Barbary at a very early period.

“ We have now ſeen that the original Tarſhiſh on the coaſt of Aſia Minor did not produce the metals imported by Solomon’s fleet; that no Tarſhiſh is to be found in the eaſtern parts of the globe; that the Tarſhiſh we are in queſt of was undoubtedly ſituated ſomewhere towards the weſt of Judea: we have ſhown that the mercantile people of Aſia Minor, Greece, and probably of Italy, actually imported ſome of thoſe articles from the coaſt of Africa; we have hazarded a conjecture, that Spain was the modern Tarſhiſh, and that very country from which Solomon imported his ſilver, and the Tyrians their ſilver, iron, tin, and lead. Let us now make a trial whether we cannot exhibit ſome internal proofs in ſupport of the hypotheſis we have above adopted.

“ The ancients divided Spain into three parts, Bætica, Luſitania, and Tarraconenſis. Bætica is the modern Andaluſia. It ſtretched along the Fretum Herculeum, or Straits of Gibraltar, to the mouth of the Guadalquiver. This region is thought by ſome to have been the Elyſian Fields of the poets. The river Bætis, which divides it, is called *Tarteſſus* by Ariſtotle, Steſichorus, Strabo, Pauſanias, Steph. Byzant. and Avianus. Here too we have a city and a lake of the ſame name. But Tarteſſus is poſitively the very ſame with Tarſhiſh. The Phœnicians, by changing *ſchin* into *thau*, made it Tartiſh. The Greeks manufactured the reſt, by changing Tartiſh into Tartis, and in proceſs of time into ταρτησσος. That the Phœnicians actually changed *ſchin* into *thau* is certain; for Plutarch tells us in the life of Sylla, that in their language an ox was called *thor*, which is, no doubt, the ſame with the Hebrew *ſhor*.

10 arſhiſh paniſh Bæ-

“ From this deduction, it appears highly probable at leaſt, that the Spaniſh Bætica was originally called *Tarſhiſh*. Indeed this ſimilarity of names has operated ſo powerfully on the learned Bochart, and on ſome other moderns of no mean figure, that they have poſitively affirmed, as Joſephus had done before them, that the patriarch Tarſhiſh actually ſettled in that country. This I ſhould think not altogether probable; but that his deſcendants who ſettled on the coaſt of Aſia Minor colonized Bætica, and carried on an uninterrupted commerce to that country, along with the Phœnicians, for many centuries after it was peopled, and that from the circumſtances above narrated, it was denominated *Tarſhiſh*, are facts too palpable to admit of contradiction.

“ Let us now ſee whether this Bætica, where I have endeavoured to fix the ſituation of the Tarſhiſh of the Scriptures, was actually furniſhed with thoſe articles of commerce which are ſaid to have been imported from that country. To enlarge on this topic would be altogether ſuperfluous. Diodorus Siculus, Strabo, Polybius, Pliny, Solinus, and, in one word, all the Greek and Roman hiſtorians who have mentioned that region, have unanimouſly exhibited it as the native land of ſilver, iron, and tin: to theſe, contrary to the opinions of the celebrated modern traveller, they likewiſe add gold in very large quantities.”

Our author having thus aſcertained the ſituation of Tarſhiſh, proceeds to prove, by a maſs of evidence too large for our inſertion, that the Edomites and Tyrians had doubled the Cape, and almoſt encompaſſed Africa, long before the era of Solomon. Then referring to 1 Kings, chap. ix. and x. 2 Chron. viii. ix. 2 Kings xxii. and 2 Chron. xx. he obſerves, that from theſe authorities it appears indubitable, that the fleets of Solomon and Hiram ſailed from Eloth and Ezion-geber; that the voyages to Ophir and Tarſhiſh were exactly the ſame, performed at one and the ſame time, by the very ſame fleet; which muſt neceſſarily have encompaſſed the peninſula of Africa before it could arrive at the country of Tarſhiſh. This being the caſe, the traders might eaſily enough collect the gold on the coaſt of Guinea, or on what is now vulgarly called the *Gold Coaſt*. The ivory they might readily enough procure on the Barbary coaſt, oppoſite to Tarſhiſh. In Africa, too, they might hunt apes, monkies, baboons, &c.; and peacocks, or rather parrots, and parroquets, they might ſurpriſe in the foreſts which abounded on the coaſt. In Spain, ſilver, iron, lead, and tin, were, one may ſay, the native produce of the ſoil. Even at this early period, the Phœnician navigators had diſcovered the Caſſiterides, or Scilly iſlands and Cornwall; and from that region, in company with the merchants, may have ſupplied them with that rare commodity.

“ I have ſuppoſed that the navy of Solomon and Hiram collected their gold in the courſe of their voyage ſomewhere on the coaſt of Africa, beyond the Cape, for the following reaſons: Had they found the golden fleece at Sofala (A), or any part of the coaſt of Africa, they would have choſen to return and unlade at Eloth or Ezion-geber, rather than purſue a long and dangerous courſe, quite round Africa, to Tarſhiſh; to which laſt country they might have ſhaped their

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(A) That Sofala oppoſite to the iſland of Madagaſcar was Ophir, was an ancient conjecture. See Bochart, Chan. L. II. Cap. 27. p. 160. 4to.

courſe much more commonly from Zidon, Tyre, Joppa, &c. But being obliged to double the Cape in queſt of ſome of theſe articles which they were enjoined to import, they puſhed onward to Tarſhiſh, and returned by the Pillars of Hercules to Tyre, or perhaps to Joppa, &c. Their next voyage commenced from one or other of theſe ports, from which they directed their courſe to Tarſhiſh; and having taken in part of their lading there, they afterwards coaſted round Africa, and ſo arrived once more at Eloth or Ezion-geber.

"Let us now attend to the ſpace of time in which theſe voyages were performed. We are told expreſsly (2 Chron. ix. 21.) that once every three years came the ſhips of Tarſhiſh, &c. This is exactly the time one would naturally imagine neceſſary to perform ſuch a diſtant voyage, at a period when navigation was ſtill in its infancy, and mariners ſeldom adventured to loſe ſight of the coaſt. Of this we have an irrefragable proof in the hiſtory of a voyage round the very ſame continent, undertaken and accompliſhed in the very ſame ſpace of time, about two centuries after.

"We learn from Herodotus, L. II. cap. 149. that [illegible] of the latter kings of Egypt, whom the Scripture calls *Pharaoh Necho*, built a great number of ſhips, both on the Red ſea and the Mediterranean. The ſame hiſtorian, Lib. IV. cap. 42. informs us, that this enterpriſing monarch projected a voyage round the the continent of Africa, which was actually accompliſhed in the ſpace of three years. In the conduct of this enterpriſe, he employed Phœnician mariners, as Solomon had done before him. Theſe, we may ſuppoſe, were aſſiſted in the courſe of this navigation by charts or journals, or at leaſt by traditional accounts derived from their anceſtors: 'Theſe navigators (ſays the hiſtorian) took their departure from a port on the Red ſea, and ſailing from thence into the ſouthern ocean, and, in the beginning of autumn, landing on the coaſt of Africa, there they ſowed ſome grain which they had carried out with them on board their veſſels. In this place they waited till the crop was ripened; and, having cut it down, they proceeded on their voyage, Having ſpent two years in this navigation, in the third they returned to Egypt, by the Pillars of Hercules. Theſe mariners, adds the author, reported a fact, which, for [illegible] part, he could by no means believe to be true, namely, that in one part of their courſe their ſhadows fell on their right; a circumſtance which gives conſiderable weight to the truth of the relation.

"Let it now be obſerved, that Phœnician mariners navigated the fleet of Solomon: the ſame people conducted that of Necho: the fleet of Necho ſpent three years in the courſe of its voyage; that of Solomon did the ſame in its courſe about two centuries before: the fleet of Necho ſailed from a port on the Red ſea; that of Solomon took its departure from Eloth or Ezion-geber, ſituated on the ſame ſea: the fleet of the former returned by the Pillars of Hercules; that of the latter, according to the hypotheſis, purſued the very ſame route. Such a coincidence of ſimilar circumſtances united with thoſe adduced in the preceding part of this article, ſeem to prove almoſt to a demonſtration, that the navy of Hiram and Solomon performed a voyage round Africa, in that age, in the ſame manner as that of Necho did two centuries after.

"Upon the whole, I conclude, that the original Ophir, which is really Aufir or Aufr, was ſituated on the ſouth of Arabia Felix, between Saba and Havilah, which laſt was encompaſſed by one of the branches of the river of Paradiſe: that the name Ophir, i. e. Aufr, was, in conſequence of its reſemblance, in proceſs of time transferred to a region on the coaſt of Africa; and that from it firſt *Afer* and then Africa was denominated: that the primitive Tarſhiſh was Cilicia, and that the Jews applied this name to all the commercial ſtates on the coaſt of Aſia Minor, and perhaps of Italy, there being ſtrong preſumptions that the Tyrrhenians were coloniſts from Tarſhiſh; that Bætica, and perhaps ſome other regions of Spain, being planted with colonies from Tarſhiſh, likewiſe acquired the name of Tarſhiſh; that the Tyrians were ſtrictly connected with the merchants of Tarſhiſh in their commercial enterpriſes; that Tarſhiſh was certainly ſituated weſtward from Judea, Phœnicia, &c.; that no other country in the weſtern quarters produced the commodities imported by the two kings, except Spain and the oppoſite coaſts; that this country, in thoſe ages, produced not only ſilver, iron, tin, and lead, but likewiſe gold in great abundance; that the merchants of Kittim imported ivory, of which the Aſherites made benches for the Tyrians; which commodity they muſt have purchaſed on the coaſt of Barbary, where the Jews and Phœnicians would find the ſame article; that Tarſhiſh being ſituated in Spain, it was impoſſible for a fleet ſailing from Eloth or Ezion-geber, to arrive at that country without encompaſſing Africa; that, of courſe, the fleet in queſtion did actually encompaſs that continent; that the Ophir of Solomon muſt have been ſituated ſomewhere on the coaſt of Africa, to the weſt of the Cape, becauſe from it the courſe to Tarſhiſh was more eligible than to return the ſame way back to Ezion-geber."

11 Ophir ſituated on the coaſt of Africa, weſt of the Cape.

Our author ſupports this concluſion by many other arguments and authorities, which the limits preſcribed us will not permit us to detail; but perhaps the article might be deemed incomplete if we did not ſhow how he obviates an objection that will readily occur to his theory. "If the original Ophir was ſeated on the coaſt of Arabia Felix, and the modern region of the ſame name on the weſt coaſt of Africa, it may be made a queſtion, how the latter country came to be denominated from the former? Nothing (ſays our author) can be more eaſy than to anſwer this queſtion. The practice of adapting the name of an ancient country to a newly diſcovered one, reſembling the other in appearance, in ſituation, in figure, in diſtance, in the nature of the climate, productions, &c. has ever been ſo common, that to produce inſtances would be altogether ſuperfluous. The newly diſcovered region on the coaſt of Africa abounded with the ſame ſpecies of commodities by which the original one was diſtinguiſhed; and of courſe, the name of the latter was annexed to the former."

12 An objection anſwered.

Whether Mr Bruce's hypotheſis, or Dr Doig's, reſpecting the long diſputed ſituation of Solomon's *Ophir*, be the true one, it is not for us to decide. Both are plauſible, both are ſupported with much ingenuity and uncommon erudition; but we do not think that the arguments of either writer furniſh a complete confutation of thoſe adduced by the other. *Sub judice lis eſt.*

OPHIRA, in botany. A genus of the monogynia order, belonging to the octandria claſs of plants. The involucrum is bivalve and triflorous; the corolla tetrapetalous above; the berry unilocular.

OPHITES, in natural hiſtory, a ſort of variegated marble, of a duſky green ground, ſprinkled with ſpots of a lighter green, otherwiſe called *ſerpentine.* See the article MARBLE.

OPHITES, in church hiſtory, Chriſtian heretics, ſo called both from the veneration they had for the ſerpent that tempted Eve, and the worſhip they paid to a real ſerpent: they pretended that the ſerpent was Jeſus Chriſt, and that he taught men the knowledge of good and evil. They diſtinguiſhed between *Jeſus* and *Chriſt:* Jeſus, they ſaid, was born of the Virgin, but Chriſt came down from heaven to be united with him; Jeſus was crucified, but Chriſt had left him to return to heaven. They diſtinguiſhed the God of the Jews, whom they termed *Jaldabaoth*, from the ſupreme God: to the former they aſcribed the body, to the latter the ſoul of men. They had a live ſerpent, which they kept in a kind of cage; at certain times they opened the cage door, and called the ſerpent: the animal came out, and mounting upon the table, twined itſelf about ſome loaves of bread; this bread they broke and diſtributed it to the company, who all kiſſed the ſerpent: this they called their *Euchariſt.*

OPHRYS, TWYBLADE: A genus of the diandria order, belonging to the gynandria claſs of plants; and in the natural method ranking under the 7th order, *Orchideæ.* The nectarium is a little carinated below. The ſpecies are numerous; but the moſt remarkable are the following:

1. The *ovata, oval-leaved ophrys,* or *common twyblade*, hath a bulbous, fibrated root; crowned by two oval, broad, obtuſe, veined, oppoſite leaves; an erect, ſucculent, green ſtalk, ſix or eight inches high, naked above, and terminated by a looſe ſpike of greeniſh flowers, having the lip of the nectarium bifid. The flowers of this ſpecies reſemble the figure of gnats.

2. The *ſpiralis, ſpiral orchis*, or *triple ladies treſſes*, hath bulbous, oblong, aggregated roots; crowned by a cluſter of oval, pointed, ribbed leaves; erect ſimple ſtalks, half a foot high; terminated by long ſpikes of white odoriferous flowers, hanging to one ſide, having the lip of the nectarium entire, and crenated.

3. The *nidus avis*, or *bird's neſt*, hath a bulbous, fibrated, cluſtered root: upright, thick, ſucculent ſtalks, a foot high, ſheathed by the leaves, and terminated by looſe ſpikes of pale brown flowers: having the lip of the nectarium bifid.

4. The *anthropophora, man-ſhaped ophrys*, or *man-orchis*, hath a roundiſh bulbous root, crowned with three or four oblong leaves; upright thick ſtalks, riſing a foot and a half high; adorned with narrow leaves, and terminated by looſe ſpikes of greeniſh flowers, repreſenting the figure of a naked man; the lip of the nectarium linear tripartite, with the middle ſegment longeſt and bifid. There is a variety with browniſh flowers tinged with green.

5. The *inſectifera*, or *inſect-orchis*, hath two roundiſh bulbous roots, crowned with oblong leaves; erect leafy ſtalks, from ſix to 10 or 12 inches high, terminated by ſpikes of inſect-ſhaped greeniſh flowers, having the lip of the nectarium almoſt five-lobed. This wonderful ſpecies exhibits flowers in different varieties, that repreſent ſingular figures of flies, bees, and other inſects; and are of different colours in the varieties.

6. The *monorchis*, or *muſky ophrys*, hath a roundiſh bulbous root; crowned with three or four oblong leaves; an erect naked ſtalk, ſix inches high; terminated by a looſe ſpike of yellowiſh, muſky ſcented flowers.

All theſe ſix ſpecies of ophrys flower in ſummer, at different times in different ſorts, from May until July; and in moſt of the ſorts exhibit a ſingularly curious appearance. The plants are all perennial in root, which are of the bulbous fleſhy kind, from which the flower-ſtalks riſe annually in ſpring, and decay in autumn; at which period is the proper time for removing the roots from one place to another. They all grow wild in Britain, &c.; are reſidents of woods, bogs, marſhy grounds, ſterile paſtures, chalky ſoils, and the like places, where they flouriſh and diſplay their ſingular flowers in great abundance, from which places they are introduced into gardens for variety; and having procured ſome plants at the proper ſeaſon, and planted them in ſoils and ſituations ſomewhat ſimilar to that where they naturally grow, the roots will abide for ſeveral years, and flower annually.

As to their propagation, it may be tried by ſeed in a ſhady border, as ſoon as it is ripe; likewiſe by offſets from the root, though they multiply ſparingly in gardens: however, roots of ſome ſtanding may be examined at the proper ſeaſon, and any offſets ſeparated and planted in the proper places.

OPHTHALMOSCOPY, a branch of phyſiognomy, which deduces the knowledge of a man's temper and manner from the appearance of his eyes.

OPHTHALMIA, in medicine, an inflammation of the membranes which inveſt the eye; eſpecially of the adnata, or albugineous coat. See MEDICINE, Nº 175.

OPIATES, medicines of a thicker conſiſtence than a ſyrup, prepared with opium ſcarcely fluid. They conſiſt of various ingredients, made up with honey or ſyrup; and are to be uſed for a long time either for purgative, alterative, or corroborative intentions.

The word *opiate* is alſo uſed, in general, for any medicine given with an intention to procure ſleep, whether in the form of electuaries, drops, or pills.

OPINION is that judgment which the mind forms of any propoſition for the truth or falſehood of which there is not ſufficient evidence to produce ſcience or abſolute belief.

That the three angles of a plane triangle are equal to two right angles, is not a matter of *opinion*, nor can it with propriety be called an object of the mathematician's *belief:* he does more than belive it; he *knows* it to be true. When two or three men, under no temptation to deceive, declare that they were witneſſes of an uncommon, though not preternatural event, their teſtimony is complete evidence, and produces abſolute *belief* in the minds of thoſe to whom it is given;

but it does not produce *ſcience* like rigid demonſtration. The fact is not doubted, but thoſe who have it on report do not *know* it to be true, as they know the truth of propoſitions intuitively or demonſtrably certain. When one or two men relate a ſtory including many circumſtances to a third perſon, and another comes who poſitively contradicts it either in whole or in part, he to whom thoſe jarring teſtimonies are given, weighs all the circumſtances in his own mind, balances the one againſt the other, and lends an aſſent, more or leſs wavering, to that ſide on which the evidence appears to preponderate. This aſſent is his *opinion* reſpecting the facts of which he has received ſuch different accounts*.

Opinions are often formed of events not yet in being. Were an officer from the combined armies, which are juſt now † beſieging Valenciennes, to come into the room where we are writing, and tell us that thoſe armies are in good health and high ſpirits; that every ſhot which they fire upon the fortreſs produces ſome effect; and that they have plenty of excellent proviſions, whilſt the beſieged are periſhing by hunger; we ſhould abſolutely *believe* every fact which he had told us upon the evidence of his teſtimony; but we could only be of *opinion* that the garriſon muſt ſoon ſurrender. In forming opinions of this kind, upon which, in a great meaſure depends our ſucceſs in any purſuit, every circumſtance ſhould be carefully attended to, and our judgments guided by former experience. Truth is a thing of ſuch importance to man, that he ſhould always purſue the beſt methods for attaining it; and when the object eludes all his reſearches, he ſhould remedy the diſappointment, by attaching himſelf to that which has the ſtrongeſt reſemblance to it; and that which moſt reſembles truth is called *probability*, as the judgment which is formed of it is termed *opinion*. See Probability.

† July 1793.

OPITS, or **Opitius** (Martin), a celebrated German poet, born at Breſlaw. He acquired great fame by his Latin, and more by his German poems; and, retiring to Dantzic, wrote a hiſtory of the ancient Daci: he died of the plague in 1639.

Opits (Henry), a learned Lutheran divine, born at Altenburg in Miſnia in 1642. He was profeſſor of theology and of the oriental languages at Kiel, where he acquired great reputation by a variety of excellent works concerning oriental literature and Hebrew antiquities. He died in 1712.

OPIUM, in the materia medica, is an inſpiſſated juice, partly of the reſinous and partly of the gummy kind, brought to us in cakes from eight ounces to a pound weight. It is very heavy, of a denſe texture, and not perfectly dry; but, in general, eaſily receives an impreſſion from the finger: its colour is a browniſh yellow, ſo very dark and duſky that at firſt it appears black: it has a dead and faint ſmell, and its taſte is very bitter and acrid. It is to be choſen moderately firm, and not too ſoft; its ſmell and taſte ſhould be very ſtrong, and care is to be taken that there be no dirty or ſtony matter in it.

Opium is the juice of the papaver album, or white poppy, with which the fields of Aſia Minor are in many places ſown, as ours are with corn. When the heads are near ripening, they wound them with an inſtrument that has five edges, which on being ſtuck into the head makes at once five long cuts in it; and from theſe wounds the opium flows, and is next day taken off by a perſon who goes round the field, and put up in a veſſel which he carries faſtened to his girdle; at the ſame time that this opium is collected, the oppoſite ſide of the poppy head is wounded, and the opium collected from it the next day. They diſtinguiſh, however, the produce of the firſt wounds from that of the ſucceeding ones; for the firſt juice afforded by the plant is greatly ſuperior to what is obtained afterwards. After they have collected the opium, they moiſten it with a ſmall quantity of water or honey, and work it a long time upon a flat, hard, and ſmooth board, with a thick and ſtrong inſtrument of the ſame wood, till it becomes of the conſiſtence of pitch; and then work it up with their hands, and form it into cakes or rolls for ſale.

Opium at preſent is in great eſteem, and is one of the moſt valuable of all the ſimple medicines. In its effects on the animal ſyſtem, it is the moſt extraordinary ſubſtance in nature. It touches the nerves as it were by magic and irreſiſtible power, and ſteeps the ſenſes in forgetfulneſs; even in oppoſition to the determined will of the philoſopher or phyſiologiſt, appriſed of its narcotic effect.

Leake's E ſay on the Diſeaſes o the Viſcer

The modification of matter is infinite; and who ſhall truly ſay by what peculiar or ſpecific configuration of its parts, opium, even in the quantity of a ſingle grain, adminiſtered to the human body, ſhall aſſuage the moſt raging pain, and procure profound ſleep?

The action of matter upon matter, thus exemplified in the effect of opium on the animal ſyſtem, is not leſs aſtoniſhing and incomprehenſible, than that of ſpirit upon matter, or the agency of mind on the motive powers of the body.

The firſt effects of opium are like thoſe of a ſtrong, ſtimulating cordial, but are ſoon ſucceeded by univerſal languor or irreſiſtible propenſity to ſleep, attended with dreams of the moſt rapturous and enthuſiaſtic kind. After thoſe contrary effects are over, which are generally terminated by a profuſe ſweat, the body becomes cold and torpid; the mind penſive and deſponding; the head is affected with ſtupor, and the ſtomach with ſickneſs and nauſea.

It is not our buſineſs, neither is it in our power, to reconcile that diverſity of opinion which has lately prevailed concerning the manner in which opium produces its effects; or to determine whether it acts ſimply on the brain and nerves, or, according to the experiments of Fontana, on the maſs of blood only.

Opium is the moſt ſovereign remedy in the materia medica, for eaſing pain and procuring ſleep, and alſo the moſt certain antiſpaſmodic yet known; but, like other powerful medicines, becomes highly noxious to the human conſtitution, and even mortal, when improperly adminiſtered. Its liberal and long-continued uſe has been obſerved greatly to injure the brain and nerves, and to diminiſh their influence on the vital organs of the body. By its firſt effects, which are exhilarating, it excites a kind of temporary delirium, which diſſipates and exhauſts the ſpirits: and, by its ſubſequent narcotic power, occaſions confuſion of ideas and loſs of memory, attended with nauſea, giddineſs, Opium. headach, and conſtipation of the bowels; in a word, it ſeems to ſuſpend or diminiſh all the natural ſecretions and excretions of the body, that of perſpiration only excepted.

Thoſe who take opium to exceſs become enervated and ſoon look old; when deprived of it, they are faint, and experience the languor and dejection of ſpirits common to ſuch as drink ſpirituous liquors in exceſs; to the bad effects of which it is ſimilar, ſince, like thoſe, they are not eaſily removed without a repetition of the doſe.

By the indiſcriminate uſe of that preparation of opium called *Godfrey's cordial*, many children are yearly cut off; for it is frequently given doſe after doſe, without moderation, by ignorant women and mercenary nurſes, to ſilence the cries of infants and lull them to ſleep, by which they are at laſt rendered ſtupid, inactive, and rickety.

Opium is univerſally known to be uſed as a luxury in the Eaſt. Mr Groſe informs us, that moſt of the hard labouring people at Surat, and eſpecially the porters, take great quantities of this drug, which, they pretend, enables them to work, and carry heavier burdens than they otherwiſe could do. Some of theſe, our author aſſures us, will take more than an ounce at a time without detriment. Many people in opulent circumſtances follow the ſame cuſtom, but with very different motives. Some uſe it merely for the ſake of the pleaſing delirium it occaſions; others for venereal purpoſes, as by this means they can lengthen the amorous congreſs as much as they pleaſe, though they thus are certain to bring on an abſolute impotency and premature old age at laſt. For this purpoſe it is uſually taken in milk; and when they have a mind to check or put an end to its operation, they ſwallow a ſpoonful or two of lime juice, or any ſimilar acid.

Beſides theſe effects of opium, it is ſaid by the Indians to have a very ſingular one in bringing on a ſeeming heavineſs of the head and ſleepineſs of the eye, at the ſame time that it really produces great watchfulneſs. It is alſo conſidered as a great inſpirer of courage, or rather inſenſibility to danger; ſo that the commanders make no ſcruple of allowing large quantities of it to the ſoldiers when they are going to battle or engaged in any hazardous enterpriſe.

The beſt opium in the world is ſaid to come from Patna on the river Ganges, where, at leaſt, the greateſt traffic of it is made, and from whence it is exported all over India; though in ſome parts, eſpecially on the Malay coaſts, it is prohibited under pain of death, on account of the madneſs, and murders conſequent upon that madneſs, which are occaſioned by it; notwithſtanding which ſevere prohibition, however, it is plentifully ſmuggled into all theſe countries.—The ſoil about the Ganges is accounted beſt for producing the ſtrongeſt kind of opium; of which the following remarkable inſtance is related. "A nabob of theſe parts having invited an Engliſh factory to an entertainment, a young gentleman, a writer in the Company's ſervice, ſauntering about the garden, plucked a poppy and ſucked the head of it. In conſequence of this he fell into a profound ſleep; of which the nabob being appriſed, and likewiſe informed of the particular bed out of which he had taken the flower, expreſſed his ſorrow; acquainting his friends at the ſame time that the poiſon was too ſtrong to admit of any remedy; which accordingly proved true, and the unfortunate gentleman never awaked."

Opium applied externally is emollient, relaxing, and diſcutient, and greatly promotes ſuppuration: if long kept upon the ſkin, it takes off the hair, and always occaſions an itching in it: ſometimes it exulcerates it, and raiſes little bliſters, if applied to a tender part. Sometimes, on external application, it allays pain, and even occaſions ſleep: but it muſt by no means be applied to the head, eſpecially to the ſutures of the ſkull; for it has been known to have the moſt terrible effects in this application, and even to bring on death itſelf.

An experimental inquiry into the properties of opium, &c.

It appears, too, from ſome curious experiments made by Dr Leigh, to act as the moſt powerful of all ſtyptics. "Having laid bare the crural artery of a rabbit (ſays the Doctor), I divided it, when the blood inſtantly flew out with conſiderable velocity; ſome of a ſtrong ſolution was then applied to the divided artery, the ends of which in a ſhort ſpace of time contracted, and the hæmorrhagy ceaſed. The ſame experiment was performed on the brachial artery with like ſucceſs."

The effects of a ſtrong ſolution of opium upon the heart, appears from the ſame experiments to be very extraordinary. "I opened the thorax of a rabbit (ſays the Doctor), and by diſſection placed the heart in full view; the aorta was then divided, and the animal bled till it expired. After the heart had remained motionleſs ten minutes, and every appearance of life had ceaſed for the ſame length of time, I poured on the heart a quantity of my ſtrong ſolution; it was inſtantly thrown into motion, which continued two minutes: I then added more of the ſolution, and the action was again renewed. By thus repeating my applications, the motions of the heart were ſupported more than ten minutes. I afterwards opened the thorax of a rabbit, and, without doing any injury to the large blood veſſels, placed the heart in view. A quantity of my ſtrong ſolution was then applied to it, which ſo accelerated the motions as to render it impoſſible to number them: by renewing the application, theſe were continued for ſome conſiderable time. The ſurface of the heart now appeared uncommonly red, and continued ſo ſome time."

Opium contains gum, reſin, eſſential oil, ſalt, and earthy matter; but its *narcotic* or ſomniferous power has been experimentally found to reſide in its *eſſential oil*.

Opium, Opobalſamum.

OPOBALSAMUM, in the materia medica. Opobalſam, or balm of Gilead. See Amyris.

Mr Bruce, the celebrated traveller, whom we have frequently had occaſion to introduce to our readers with that praiſe to which we think his labours have fully entitled him, employs ſeveral pages of his Appendix in aſcertaining the antiquity and native ſoil of the balſam tree, with other particulars of that nature; after which he gives us the following account of the opobalſamum, or juice flowing from it: "At firſt when it is received into the bottle or vaſe from the wound from whence it iſſues, it is of a light yellow colour, apparently turbid, in which there is a whitiſh caſt, which I apprehend are the globules of air that pervade the whole of it in its firſt ſtate of fermentation; it then appears very light upon ſhaking. As it ſettles and cools, it turns clear, and loſes that milkineſs which it firſt had when flowing from the tree into the bottle. It then has the colour of honey, and appears more fixed and heavy than at firſt. After being kept for years, it grows a much deeper yellow, and of the colour of gold. I have ſome of it, which, as I have already mentioned in my Travels, I got from the cadi of Medina in the 1768; it is now ſtill deeper in colour, full as much ſo as the yelloweſt honey. It is perfectly fluid, and has loſt very little either of its taſte, ſmell, or weight. The ſmell at firſt is violent and ſtrongly pungent, giving a ſenſation to the brain like to that of volatile ſalts when raſhly drawn up by an incautious perſon. This laſts in proportion to its freſhneſs; for being neglected, and the bottle uncorked, it quickly loſes this quality, as it probably will at laſt by age, whatever care is taken of it.

"In its pure and freſh ſtate it diſſolves eaſily in water. If dropped on a woollen cloth, it will waſh out eaſily, and leaves no ſtain. It is of an acrid, rough, pungent taſte; is uſed by the Arabs in all complaints of the ſtomach and bowels, is reckoned a powerful antiſeptic, and of uſe in preventing any infection of the plague. Theſe qualities it now enjoys, in all probability, in common with the various balſams we have received from the new world, ſuch as the balſam of Tolu, of Peru, and the reſt; but it is always uſed, and in particular eſteemed by the ladies as a coſmetic: As ſuch it has kept up its reputation in the eaſt to this very day. The manner of applying it is this: You firſt go into the tepid bath till the pores are ſufficiently opened: you then anoint yourſelf with a ſmall quantity, and as much as the veſſels will abſorb. Never-fading youth and beauty are ſaid to be the conſequences of this. The purchaſe is eaſy enough. I do not hear that it ever has been thought reſtorative after the loſs of either."

OPOCALPASUM, Opocarbasum, or Apocalpasum; a gummy reſinous ſubſtance, which has a ſtrong reſemblance to the beſt liquid myrrh, and which in the time of Galen they mixed with myrrh. It was difficult, according to this writer, to diſtinguiſh the one from the other unleſs by their effects. It was a poiſonous juice, which frequently produced lethargy and ſudden ſtrangling. He declares that he has known ſeveral perſons who died in conſequence of inadvertently taking myrrh in which there was a mixture of opocarbaſum. Perhaps it was only a juice compoſed of a ſolution of euphorbia, in which drops of opium were macerated. Poiſons of this kind have from time immemorial been as common in Africa as that of arrows poiſoned with the juice of the mancanilla is in America.

Mr Bruce, the Abyſſinian traveller, ſays that he ſaw in a Mahometan village a large tree, which was ſo covered with knots and balls of gum on the upper part of the trunk and on the large branches, that it had a monſtrous appearance. From ſome inquiries which he made on this ſubject, he found that certain merchants had brought this tree from the country of the good myrrh, which is Troglodytria (for it does not grow in Arabia), and that they had planted it for the ſake of its gum; with which theſe Muſſulmans ſtarch the blue ſtuffs of Surat, which they receive damaged from Mocha, in order to barter them with the Galla and the Abyſſinians. This tree is called *ſaſſa*; and Mr Bruce declares that he has ſeen it completely covered with beautiful crimſon flowers of a very uncommon ſtructure. The ſame traveller obſerves, that the ſaſſa gum is well calculated, both on account of its abundance and its colour, to augment the quantity of myrrh; and he is the more confirmed in his opinion, becauſe every thing leads him to think that no other gummiferous tree, poſſeſſed of the ſame properties with the ſaſſa, grows in the myrrh country. In ſhort, he thinks it almoſt beyond a doubt that the gum of the ſaſſa tree is the opocalpaſum; and he ſuppoſes Galen miſtaken in aſcribing any fatal property to this drug; and that many were believed to be killed by it, whoſe death might, perhaps, with more juſtice, have been placed to the account of the phyſician. Mr Bruce adds, that though the Troglodites of the myrrh country are at preſent more ignorant than formerly, they are nevertheleſs well acquainted with the properties of their ſimples: and that while they wiſh to increaſe the ſale of their commodities, they would never mix with them a poiſon which muſt neceſſarily diminiſh it. In this we accede to his opinion; but we muſt differ from him when he ſays that no gum or reſin with which we are acquainted is a mortal poiſon: the ſavages of both hemiſpheres are acquainted with but too many of them. The gum of the ſaſſa tree, according to Mr Bruce, is of a cloſe ſmooth grain, of a brown dull colour, but ſometimes very tranſparent; it ſwells and becomes white in water; it has a great reſemblance in its properties to gum tragacanth, and may be eaten with all ſafety. From all this it appears that the opocalpaſum mentioned by Pliny is not the ſaſſa gum deſcribed by Mr Bruce.

OPOPANAX, in the materia medica, is a gum-reſin of a tolerably firm texture, uſually brought to us in looſe granules or drops, and ſometimes in large maſſes, formed of a number of theſe connected by a quantity of matter of the ſame kind; but theſe are uſually loaded with extraneous matter, and are greatly inferior to the pure looſe kind. The drops or granules of the fine opopanax are on the outſide of a browniſh red colour, and of a duſky yellowiſh or whitiſh colour within: they are of a ſomewhat unctuous appearance, ſmooth on the ſurface; and are to be choſen in clear pieces, of a ſtrong ſmell and acrid taſte.

This gummy ſubſtance is obtained from the roots of an umbelliferous plant, which grows ſpontaneouſly in the warmer countries, and bears the colds of this. The juice is brought from Turkey and the Eaſt Indies; and its virtues are thoſe of an attenuating and aperient medicine. Boerhaave frequently employed it, along with ammoniacum and galbanum, in hypochondriacal diſorders, obſtructions of the abdominal viſcera, and ſuppreſſions of [illegible] menſtrual evacuations from a ſluggiſhneſs of mucous humours, and a want of due elaſticity of the ſolids: [illegible] theſe intentions it is an uſeful ingredient in the pilulæ gummoſæ and compound powder of myrrh of the London Pharmacopœia, but it is not employed in any compoſition of the Edinburgh.—It may be given by itſelf in the doſe of a ſcruple, or half a drachm: a whole drachm proves in many conſtitutions gently purgative: alſo diſpels flatulencies, is good in aſthmas, in inveterate coughs, and in diſorders of the head and nerves.

Doctor Woodville, in his Medical Botany, gives the following account of this vegetable: "It is of the *digynia* order, and *pentandria* claſs of plants: the root is

Opoponax,
a species of Pastinaca.

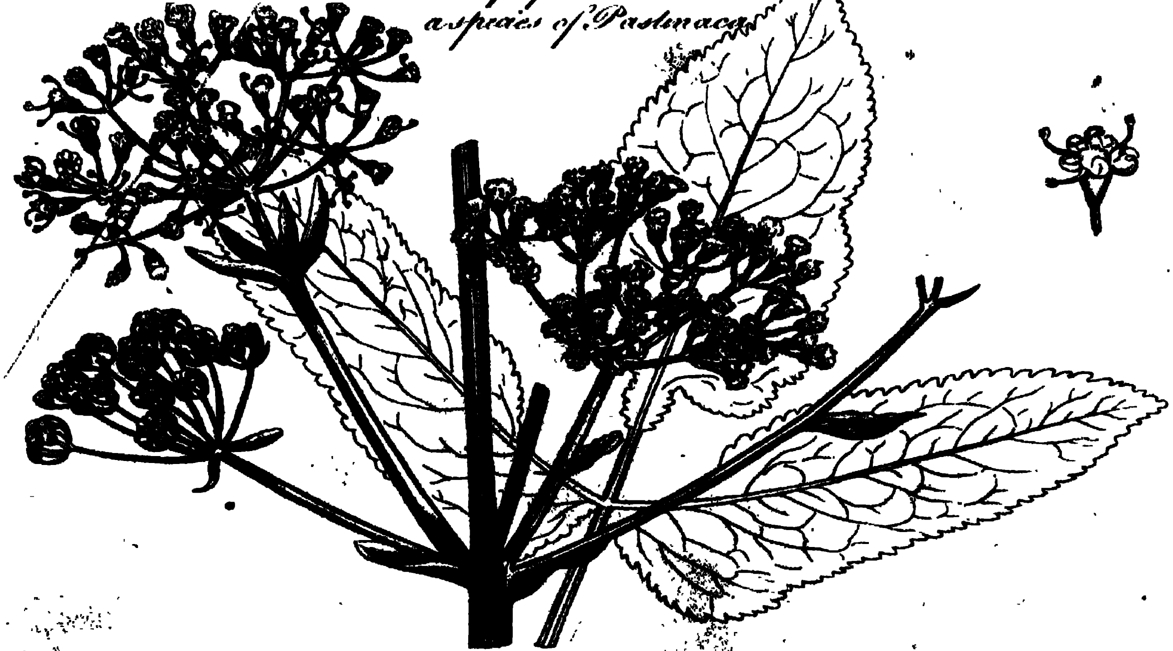
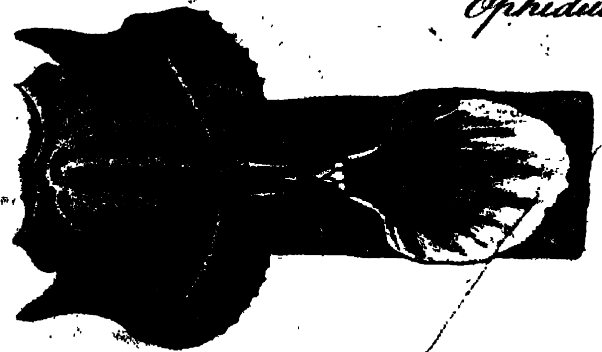


Fig. 4.



Ophidium barbatum.

Fig. 1.

Fig. 5.

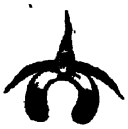


Fig. 6.

Fig. 3.

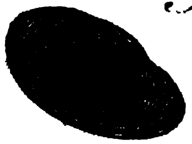
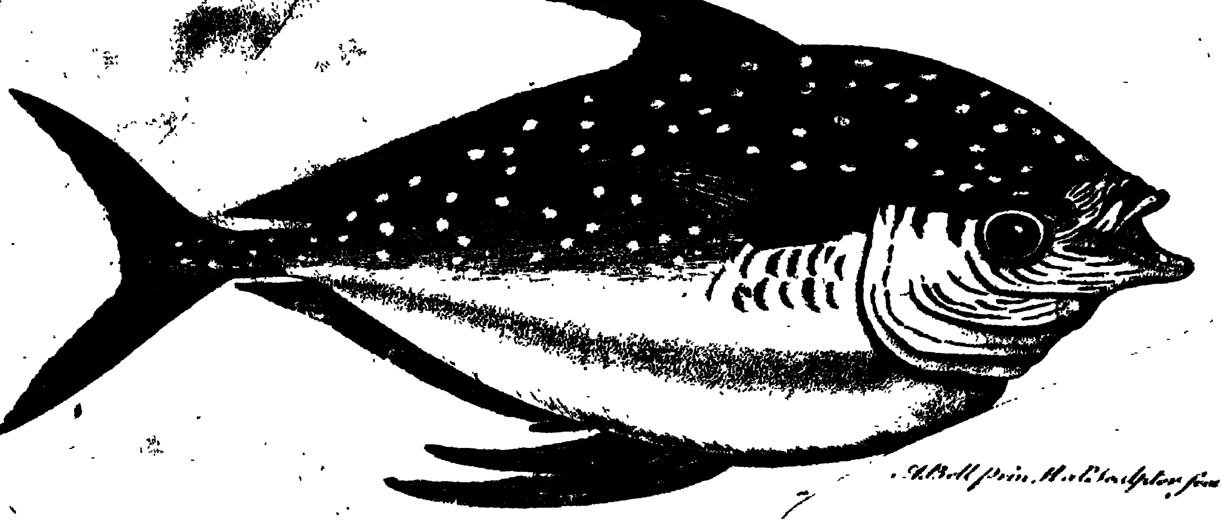


Fig. 2

Opah.



A. Bell Prin. Wal. Sculptor fecit.

perennial, thick, fleſhy, tapering like the garden parſnep: the ſtalk is ſtrong, branched rough towards the bottom, and riſes ſeven or eight feet in height; the leaves are pinnated, conſiſting of ſeveral pairs of pinnæ, which are oblong, ſerrated, veined, and towards the baſe appear unformed on the upper ſide: the flowers are ſmall, of a yellowiſh colour, and terminate the ſtem and branches in flat umbels; the general and partial umbels are compoſed of many radii; the general and partial involucra are commonly both wanting; all the florets are fertile, and have an uniform appearance; the petals are five, lance-ſhaped, and curled inwards; the five filaments are ſpreading, curved, longer than the petals, and furniſhed with roundiſh antheræ; the germen is placed below the corolla, ſupporting two reflexed ſtyles, which are ſupplied with blunt ſtigmata; the fruit is elliptical, compreſſed, divided into two parts, containing two flat ſeeds, encompaſſed with a narrow border. See Plate CCCLI. It is a native of the ſouth of Europe, and flowers in June and July.

"This ſpecies of parſnep was cultivated in 1731 by Mr P. Miller, who obſerves, that its 'roots are large, ſweet, and accounted very nouriſhing,' therefore recommended for cultivation in kitchen gardens. It bears the cold of our climate very well, and commonly maturates its ſeeds, and its juice here manifeſts ſome of thoſe qualities which are diſcovered in the officinal opopanax; but it is only in the warm regions of the eaſt, and where this plant is a native, that its juice concretes into this gummy reſinous drug. Opopanax is obtained by means of inciſions made at the bottom of the ſtalk of the plant, from whence the juice gradually exudes; and by undergoing ſpontaneous concretion, aſſumes the appearance under which we have it imported from Turkey and the Eaſt Indies. It readily mingles with water, by triture, into a milky liquor, which on ſtanding depoſites a portion of reſinous matter, and becomes yellowiſh: to rectified ſpirit it yields a gold-coloured tincture, which taſtes and ſmells ſtrongly of opopanax. Water diſtilled from it is impregnated with its ſmell, but no eſſential oil is obtained on committing moderate quantities to the operation." See Pastanaca, of which opopanax is a ſpecies.

OPORTO, or Porto; a rich, handſome, and conſiderable town of Portugal, in the province of Entre Douro e Minho, with a biſhop's ſee. It is a place of great importance, and by nature almoſt impregnable. It is noted for its ſtrong wines; and a large quantity is from thence exported into Britain, whence all red wines that come from Spain or Portugal are called *port wines*. It is ſeated on the declivity of a mountain near the river Duero, which forms an excellent harbour. W. Long. 8. 1. N. Nat. 41. 0.

OPOSSUM, in zoology. See Didelphis.

OPPENHEIM, a town of Germany, in the lower palatinate of the Rhine, and capital of a bailiwick of the ſame name; ſeated on the declivity of a hill near the Rhine. E. Long. 8. 20. N. Lat. 49. 48.

OPPIANUS, a poet and grammarian of Anazarba in Cilicia, in the ſecond century. He compoſed a poem of hunting, and another of fiſhing, for which Antoninus Caracalla gave him as many golden crowns as there were verſes in his poems; they were hence called *Oppian's golden verſes*. He died in the 30th year of his age.

OPPILATION, in medicine, the act of obſtructing or ſtopping up the paſſage of the body, by redundant or peccant humours. This word is chiefly uſed for obſtructions in the lower belly.

OPTATIVE mood, in grammar, that which ſerves to expreſs an ardent deſire or wiſh for ſomething.

In moſt languages, except the Greek, the optative is only expreſſed by prefixing to the ſubjunctive an adverb of wiſhing: as *utinam*, in Latin; *plut à Dieu*, in French; and *would to God*, in Engliſh.

OPTIC angle, the angle which the optic axes of both eyes make with one another, as they tend to meet at ſome diſtance before the eyes.

Optic *Axis*, the axis of the eye, or a line going through the middle of the pupil and the centre of the eye.

OPTICS,

THAT ſcience which treats of the element of light, and the various phenomena of viſion.

HISTORY.

§ 1. *Diſcoveries concerning the Light.*

1 Difficulties attending the explanation of the phenomena of

The element of Light has occupied much of the attention of thinking men ever ſince the phenomena of nature have been the objects of rational inveſtigation. The diſcoveries that have from time to time been made concerning it, are ſo fully inſerted under the article Light, that there is little room for any further addition here. The nature of that ſubtile element is indeed very little known as yet, notwithſtanding all the endeavours of philoſophers; and whatever ſide is taken with regard to it, whether we ſuppoſe it to conſiſt of an infinity of ſmall particles propagated by a repulſive power from the luminous body, or whether we ſuppoſe it to conſiſt in the vibrations of a ſubtile fluid, there are prodigious difficulties, almoſt, if not totally inſuperable, which will attend the explanation of its phenomena. In many parts of this work the identity of light and of the electric fluid is aſſerted: this, however, doth not in the leaſt interfere with the phenomena of optics; all of which are guided by the ſame invariable laws, whether we ſuppoſe light to be a vibration of that fluid, or any thing elſe. We ſhall therefore proceed to,

§ 2. *Diſcoveries concerning the Refraction of Light.*

2 Refraction known to the ancients;

We find that the ancients, though they made very few optical experiments, nevertheleſs knew, that when light paſſed through mediums of different denſities, it did not move forward in a ſtraight line, but was bent or *refracted*, out of its courſe. This was probably ſuggeſted to them by the appearance of a ſtraight ſtick partly immerſed in water; and we find many queſtions concerning this and other optical appearances in Ariſtotle; to which, however, his anſwers are inſignificant. Archimedes is even ſaid to have written a treatiſe concerning the appearance of a ring or circle under water, and therefore could not have been ignorant of the common phenomena of refraction. But the ancients were not only acquainted with theſe more ordinary appearances of refraction, but knew alſo the production of colours by refracted light. Seneca ſays, that if the light of the ſun ſhines through an angular piece of glaſs, it will ſhow all the colours of the rainbow. Theſe colours, however, he ſays, are falſe, ſuch as are ſeen in a pigeon's neck when it changes its poſition; and of the ſame nature, he ſays, is a ſpeculum, which, without having any colour of its own, aſſumes that of any other body. It appears alſo, that the ancients were not unacquainted with the magnifying power of glaſs globes filled with water, though they do not ſeem to have known any thing of the reaſon of this power; and the ancient engravers are ſuppoſed to have made uſe of a glaſs globe filled with water to magnify their figures, and thereby to work to more advantage. That the power of tranſparent bodies of a ſpherical form in magnifying or burning was not wholly unknown to the ancients, is further probable from certain gems preſerved in the cabinets of the curious, which are ſuppoſed to have belonged to the Druids. They are made of rock cryſtal, of various forms, amongſt which are found ſome that are lenticular and others that are ſpherical: and though they are not ſufficiently wrought to perform their office as well as they might have done if they had been more judiciouſly executed, yet it is hardly poſſible that their effect, in magnifying at leaſt, could have eſcaped the notice of thoſe who had often occaſion to handle them; if indeed, in the ſpherical or lenticular form, they were not ſolely intended for the purpoſes of burning. One of theſe, of the ſpherical kind, of about an inch and a half diameter, is preſerved among the foſſils given to the univerſity of Cambridge by Dr Woodward.

3
and the magnifying power of glaſs globes.

The firſt treatiſe of any note written on the ſubject of optics, was by the celebrated aſtronomer Claudius Ptolemæus, who lived about the middle of the ſecond century. The treatiſe is loſt; but from the accounts of others we find that he treated of aſtronomical refractions.

4
Refraction firſt treated ſcientifically by Ptolemy.

Though refraction in general had been obſerved very early, it is poſſible that it might not have occurred to any philoſopher much before his time, that the light of the ſun, moon, and ſtars, muſt undergo a ſimilar refraction in conſequence of falling obliquely upon the groſs atmoſphere that ſurrounds the earth; and that they muſt, by that means, be turned out of their rectilinear courſe, ſo as to cauſe thoſe luminaries to appear higher in the heavens than they would otherwiſe do. The firſt aſtronomers were not aware that the intervals between ſtars appear leſs near the horizon than near the meridian; and, on this account, they muſt have been much embarraſſed in their obſervations. But it is evident that Ptolemy was aware of this circumſtance, by the caution that he gives to allow ſomething for it, upon every recourſe to ancient obſervations.

5
His hypotheſis concerning the horizontal ſun and moon.

This philoſopher alſo advances a very ſenſible hypotheſis to account for the remarkably greater apparent ſize of the ſun and moon when ſeen near the horizon. The mind, he ſays, judges of the ſize of objects by means of a preconceived idea of their diſtance from us: and this diſtance is fancied to be greater when a number of objects are interpoſed between the eye and the body we are viewing; which is the caſe when we ſee the heavenly bodies near the horizon. In his Almageſt, however, he aſcribes this appearance to a refraction of the rays by vapours, which actually enlarge the angle under which the luminaries appear; juſt as the angle is enlarged by which an object is ſeen from under water.

In the 12th century, the nature of refraction was largely conſidered by Alhazen an Arabian writer; inſomuch that, having made experiments upon it at the common ſurface between air and water, air and glaſs, water and glaſs or cryſtal; and, being prepoſſeſſed with the ancient opinion of cryſtalline orbs in the regions above the atmoſphere, he even ſuſpected a refraction there alſo, and fancied he could prove it by aſtronomical obſervations.

6
Diſcoveries of Alhazen

This author deduces from hence ſeveral properties of atmoſpherical refraction, as that it increaſes the altitudes of all objects in the heavens; and he firſt advanced, that the ſtars are ſometimes ſeen above the horizon by means of refraction, when they are really below it. This obſervation was confirmed by Vitellio, B. Waltherus, and eſpecially by the excellent obſervations of Tycho Brahe. Alhazen obſerved, that refraction contracts the vertical diameters and diſtances of the heavenly bodies, and that it is the cauſe of the twinkling of the ſtars. But we do not find that either he, or his follower Vitellio, knew any thing of its juſt quantity. Indeed it is too ſmall to be determined except by very accurate inſtruments, and therefore we hear little more of it till about the year 1500; at which time great attention was paid to it by Bernard Walther, Mæſtlin, and others, but chiefly by Tycho Brahe.

Alhazen ſuppoſed that the refraction of the atmoſphere did not depend upon the vapours in it, as was probably the opinion of philoſophers before his time, but on the different tranſparency; by which, as Montucla conjectures, he meant the denſity of the groſs air contiguous to the earth, and the ether or ſubtile air that lies beyond it. In examining the effects of refraction, he endeavours to prove that it is ſo far from being the cauſe of the heavenly bodies appearing larger near the horizon, that it would make them appear leſs; two ſtars, he ſays, appearing nearer together in the horizon, than near the meridian. This phenomenon he ranks among optical deceptions. We judge of diſtance, he ſays, by comparing the angle under which objects appear, with their ſuppoſed diſtances; ſo that if theſe angles be nearly equal, and the diſtance of one object be conceived greater than that of the other, it will be imagined to be larger. And the ſky near the horizon, he ſays, is always imagined to be further from us than any other part of the concave ſurface. Roger Bacon aſcribes this account of the horizontal moon to Ptolemy; and as ſuch it is examined, and objected to by B. Porta.

In the writings of this Bacon, whoſe genius perhaps equalled that of his great nameſake Lord Verulam, we find the firſt diſtinct account of the magnifying power of glaſſes; and it is not improbable, that what he wrote upon this ſubject gave riſe to that moſt uſeful invention of ſpectacles. For he ſays, that if an object be applied cloſe to the baſe of the large ſegment of a ſphere of glaſs, it will appear magnified. He alſo treats of the appearance of an object through a globe, and ſays that he was the firſt who obſerved the refraction of rays into it.

7 Of Vitellio. In 1270, Vitellio, a native of Poland, publiſhed a treatiſe of optics, containing all that was valuable in Alhazen, and digeſted in a much more intelligible and methodical manner. He obſerves, that light is always loſt by refraction, in conſequence of which the objects ſeen by refracted light always appear leſs luminous; but he does not pretend to eſtimate the quantity of this loſs. He reduced into a table the reſult of his experiments on the refractive powers of air, water, and glaſs, correſponding to different angles of incidence. In his account of the horizontal moon he agrees exactly with Alhazen: obſerving, that in the horizon ſhe ſeems to touch the earth, and appears much more diſtant from us than in the zenith, on account of the intermediate ſpace containing a greater variety of objects upon the viſible ſurface of the earth. He aſcribes the twinkling of the ſtars to the motion of the air in which the light is refracted; and to illuſtrate this hypotheſis, he obſerves, that they twinkle ſtill more when viewed in water put in motion. He alſo ſhows, that refraction is neceſſary as well as reflection, to form the rainbow; becauſe the body which the rays fall upon is a tranſparent ſubſtance, at the ſurface of which one part of the light is always reflected and another refracted. But he ſeems to conſider refraction as ſerving only to condenſe the light, and thereby enabling it to make a ſtronger impreſſion upon the eye. This writer makes alſo many ingenious attempts to explain refraction, or to aſcertain the law of it. He alſo conſiders the foci of glaſs ſpheres, and the apparent ſize of objects ſeen through them: though upon theſe ſubjects he is not at all exact. It is ſufficient indeed to ſhow the ſtate of knowledge, or rather of ignorance, at that time, to obſerve, that both Vitellio, and his maſter Alhazen, endeavour to account for objects appearing larger when they are ſeen under water by the circular figure of its ſurface; ſince, being fluid, it conforms to the figure of the earth.

Of Roger Bacon. Contemporary with Vitellio was Roger Bacon, a man of very extenſive genius, and who wrote upon almoſt every branch of ſcience; yet in this branch he does not ſeem to have made any conſiderable advances beyond what Alhazen had done before him. Even ſome of the wildeſt and moſt abſurd of the opinions of the ancients have had the ſanction of his authority. He does not heſitate to aſſent to an opinion [illegible] many of the ancients, and indeed by moſt [illegible]ers till his time, that viſual rays proceed from the eye; giving this reaſon for it, that every thing in nature is qualified to diſcharge its proper functions by its own powers, in the ſame manner as the ſun and other celeſtial bodies. In his *Specula Mathematica*, he added ſome obſervations on the refraction of the light of the ſtars; the apparent ſize of objects; the extraordinary ſize of the ſun and moon in the horizon: but in all this he is not very exact, and advances but little. In his *Opus Majus* he demonſtrates, that if a tranſparent body interpoſed between the eye and an object, be convex towards the eye, the object will appear magnified. This obſervation, however, he certainly had from Alhazen; the only difference between them is, that Bacon prefers the ſmaller ſegment of a ſphere, and Alhazen the larger, in which the latter certainly was right.

From this time, to that of the revival of learning in Europe, we have no farther treatiſe on the ſubject of refraction, or indeed on any other part of optics. 9 Of Maurolycus. One of the firſt who diſtinguiſhed himſelf in this way was Maurolycus, teacher of mathematics at Meſſina. In a treatiſe, *De Lumine et Umbra*, publiſhed in 1575, he demonſtrates that the cryſtalline humour of the eye is a lens that collects the rays of light iſſuing from the objects and throws them upon the retina where is the focus of each pencil. From this principle he diſcovered the reaſon why ſome people were ſhort-ſighted and others long-ſighted; and why the former are relieved by concave, and the others by convex, glaſſes.

10 Diſcoveries of B. Porta. About the ſame time that Maurolycus made ſuch advances towards the diſcovery of the nature of viſion, Joannes Baptiſta Porta of Naples diſcovered the *camera obſcura*, which throws ſtill more light on the ſame ſubject. His houſe was conſtantly reſorted to by all the ingenious perſons at Naples, whom he formed into what he called *an academy of ſecrets*; each member being obliged to contribute ſomething that was not generally known, and might be uſeful. By this means he was furniſhed with materials for his *Magia Naturalis*, which contains his account of the *camera obſcura*, and the firſt edition of which was publiſhed, as he informs us, when he was not quite 15 years old. He alſo gave the firſt hint of the magic lantern; which Kircher afterwards followed and improved. His experiments with the *camera obſcura* convinced him, that viſion is performed by the intromiſſion of ſomething into the eye, and not by viſual rays proceeding from the eye, as had been formerly imagined; and he was the firſt, who fully ſatisfied himſelf and others upon this ſubject. Indeed the reſemblance between experiments with the *camera obſcura* and the manner in which viſion is performed in the eye, was too ſtriking to eſcape the obſervation of a leſs ingenious perſon. But when he ſays that the eye is a *camera obſcura*, and the pupil the hole in the window ſhutter, he was ſo far miſtaken as to ſuppoſe that it was the cryſtalline humour that correſponds to the wall which receives the images; nor was it diſcovered till the year 1604, that this office is performed by the retina. He makes a variety of juſt obſervations concerning viſion; and particularly explains ſeveral caſes in which we imagine things to be without the eye, when the appearances are occaſioned by ſome affection of the eye itſelf, or ſome motion within the eye. He obſerves alſo, that, in certain circumſtances, viſion will be aſſiſted by convex or concave glaſſes; and he ſeems alſo to have made ſome ſmall advances towards the diſcovery of teleſcopes. He takes notice, that a round and flat ſurface plunged into water, will appear hollow as well as magnified to an eye perpendicularly over it; and he very well explains by a figure the manner in which it is done.

11 The law of refraction diſcovered. All this time, however, the great problem concerning the meaſuring of refractions had remained unſolved. Alhazen and Vitellio, indeed, had attempted it; but failed, by attempting to meaſure the angle itſelf inſtead of its ſine. At laſt it was diſcovered by Snellius, profeſſor of mathematics at Leyden. This philoſopher, however, did not perfectly underſtand his own diſcovery, nor did he live to publiſh any account of it himſelf. It was afterwards explained by Profeſſor Hortenſius both publicly and privately before

fore it appeared in the writings of Deſcartes, who publiſhed it under a different form, without making any acknowledgment of his obligations to Snellius, whoſe papers Huygens aſſures us, from his own knowledge, Deſcartes had ſeen. Before this time Kepler had publiſhed a New Table of refracted Angles, determined by his own experiments for every degree of incidence. Kircher had done the ſame, and attempted a rational or phyſical theory of refraction, on principles, and on a mode of inveſtigation, which, if conducted with preciſion, would have led him to the law aſſumed or diſcovered by Snellius.

12
Opinions of Deſcartes and Leibnitz on this ſubject.

Deſcartes undertook to explain the cauſe of refraction by the reſolution of forces, on the principles of mechanics. In conſequence of this, he was obliged to ſuppoſe that light paſſes with more eaſe through a denſe medium, than through a rare one. The truth of this explanation was firſt queſtioned by M. Fermat, counſellor to the parliament of Thoulouſe, and an able mathematician. He aſſerted, contrary to the opinion of Deſcartes, that light ſuffers more reſiſtance in water than air, and more in glaſs than in water; and he maintained, that the reſiſtance of different mediums with reſpect to light is in proportion to their denſities. M. Leibnitz adopted the ſame general idea; and theſe gentlemen argued upon the ſubject in the following manner:—

Nature, ſay they, accompliſhes her ends by the ſhorteſt methods. Light therefore ought to paſs from one point to another, either by the ſhorteſt road, or that in which the leaſt time is required. But it is plain that the line in which light paſſes, when it falls obliquely upon a denſer medium, is not the moſt direct or the ſhorteſt; ſo that it muſt be that in which the leaſt time is ſpent. And whereas it is demonſtrable, that light falling obliquely upon a denſer medium (in order to take up the leaſt time poſſible in paſſing from a point in one medium to a point in the other) muſt be refracted in ſuch a manner, that the ſines of the angles of incidence and refraction muſt be to one another, as the different facilities with which light is tranſmitted in thoſe mediums; it follows, that ſince light approaches the perpendicular when it paſſes obliquely from air into water, ſo that the ſine of the angle of refraction is leſs than that of the angle of incidence, the facility with which water ſuffers light to paſs through it is leſs than that of the air; ſo that light meets with more reſiſtance in water than air.

13
D[illegible]
[illegible]ferent
ſtances.

Arguments of this kind could not give ſatisfaction; and a little time ſhowed the fallacy of the hypotheſis. [illegible] meeting of the Royal Society, Aug. 31. 1664, an experiment for meaſuring the refraction of common water was made with a new inſtrument which they had prepared for that purpoſe; and, the angle of incidence being 40 degrees, that of refraction was found to be 30. About this time alſo we find the firſt mention of mediums not refracting the light in an exact proportion to their denſities. For Mr Boyle, in a letter to Mr Oldenburgh, dated Nov. 3. 1664, obſerves, that in ſpirit of wine, the proportion of the ſines of the angles of incidence to the ſines of the angles of refraction was nearly the ſame as 4 to 3; and that, as ſpirit of wine occaſions a greater refraction than common water, ſo oil of turpentine, which is lighter than ſpirit of wine, produces not only a greater refraction than common water, but a much greater than ſalt water. And at a meeting held Nov. 9. the ſame year, Dr Hooke (who had been ordered to proſecute the experiment) brought in an account of one that he had made with pure and clear ſalad oil, which was found to have produced a much greater refraction than any liquor which he had then tried; the angle of refraction that anſwered to an angle of incidence of 30° being found no leſs than 40° 30′, and the angle of refraction that anſwered to an angle of incidence of 20° being 29° 47′.—M. de la Hire alſo made ſeveral experiments to aſcertain the refractive power of oil with reſpect to that of water and air, and found the ſine of the angle of incidence to that of refraction to be as 60 to 42; which, he obſerves, is a little nearer to that of glaſs than to that of water, though oil is much lighter than water, and glaſs much heavier.

The members of the Royal Society finding that the refraction of ſalt water exceeded that of freſh, purſued the experiment farther with ſolutions of vitriol, ſaltpetre, and alum, in water; when they found the refraction of the ſolution of vitriol and ſaltpetre a little more, but that of alum a little leſs, than common water.

Dr Hooke made an experiment before the Royal Society, Feb. 11. 1663, which clearly proves that ice refracts the light leſs than water; which he took to be a good argument that the lightneſs of ice, which cauſes it to ſwim in water, is not cauſed only by the ſmall bubbles which are viſible in it, but that it ariſes from the uniform conſtitution or general texture of the whole maſs. M. de la Hire alſo took a good deal of pains to determine whether, as was then the common opinion, the refractive power of ice and water were the ſame; and he found as Dr Hooke had done before, that ice refracts leſs than water.

By a moſt accurate and elaborate experiment made in the year 1698, in which a ray of light was tranſmitted through a Torricellian vacuum, Mr Lowthorp found, that the refractive power of air is to that of water as 36 to 34,400. He concludes his account of the experiment with obſerving, that the refractive power of bodies is not proportioned to the denſity, at leaſt not to the gravity, of the refracting medium. For the refractive power of glaſs to that of water is as 55 to 34, whereas its gravity is as 87 to 34; that is, the ſquares of their refractive powers are very nearly as their reſpective gravities. And there are ſome fluids, which though they are lighter then water, yet have a greater power of refraction. Thus the refractive power of ſpirit of wine, according to Dr Hooke's experiment, is to that of water as 36 to 33, and its gravity reciprocally as 33 to 36, or 36½. But the refractive powers of air and water ſeem to obſerve the ſimple proportion of their gravities directly. And if this ſhould be confirmed by ſucceeding experiments, it is probable, he ſays, that the refractive powers of the atmoſphere are everywhere, and at all heights above the earth, proportioned to its denſity and expanſion; and then it would be no difficult matter to trace the light through it, ſo as to terminate the ſhadow of the earth ſound, together with proper expedients for meaſuring the quantity of light illuminating an opaque body, to examine at what diſtances the moon muſt be from the earth to ſuffer eclipſes of the obſerved durations.

Caſſini the younger happened to be preſent when Mr Lowthorp made the above-mentioned experiment before the Royal Society; and upon his return home, having made a report of it to the members of the Royal Academy of Sciences, thoſe gentlemen endeavoured to repeat the experiment in 1700; but they did not ſucceed.—For, as they ſaid, beams of light paſſed through the vacuum without ſuffering any refraction. The Royal Society being informed of this, were deſirous that it might be put paſt diſpute, by repeated and well atteſted trials; and ordered Mr Haukſbee to make an inſtrument for the purpoſe, by the direction of Dr Halley. It conſiſted of a ſtrong braſs prism, two ſides of which had ſockets to receive two plane glaſſes, whereby the air in the priſm might either be exhauſted or condenſed. The priſm had alſo a mercurial gage fixed to it, to diſcover the denſity of the contained air; and was contrived to turn upon its axis, in order to make the refractions equal on each ſide when it was fixed to the end of a teleſcope. The refracting angle was near 64°; and the length of the teleſcope was about 10 feet, having a fine hair in its focus. The event of this accurate experiment was as follows:—

Having choſen a proper and very diſtinct erect object, whoſe diſtance was 2588 feet, June 15. O. S. 1708, in the morning, the barometer being then at 29.7$\frac{1}{2}$, and the thermometer at 60, they firſt exhauſted the priſm, and then applying it to the teleſcope, the horizontal hair in the focus covered a mark on the object diſtinctly ſeen through the vacuum, the two glaſſes being equally inclined to the viſual ray. Then admitting the air into the priſm, the object was ſeen to riſe above the hair gradually as the air entered, and in the end the hair was obſerved to hide a mark 10$\frac{1}{4}$ inches below the former mark. This they often repeated, and with the ſame ſucceſs.

After this they applied the condenſing engine to the priſm; and having forced in another atmoſphere, ſo that the denſity of the included air was double to that of the outward, they again placed it before the teleſcope, and, letting out the air, the object which before ſeemed to riſe, appeared gradually to deſcend, and the hair at length reſted on an object higher than before by the ſame interval of 10$\frac{1}{4}$ inches. This experiment they likewiſe frequently repeated without any variation in the event.

They then forced in another atmoſphere; and upon diſcharging the condenſed air, the object was ſeen near 21 inches lower than before.

Now the radius in this caſe being 2588 feet, 10$\frac{1}{4}$ inches will ſubtend an angle of one minute and 8 ſeconds, and the angle of incidence of the viſual ray being 32 degrees (becauſe the angle of the glaſs planes was 64), it follows from the known laws of refraction, that as the ſine of 39° is to that of 31° 59′ 26″, differing from 32° by 34″ the half of 1′ 8″; ſo is the ſine of any other incidence, to the ſine of its angle of refraction; and ſo is radius, or 1000000, to 999736; which, therefore, is the proportion between the ſine of incidence *in vacuo* and the ſine of refraction from thence into common air.

14 Refractive power of the air determined.

It appears, by theſe experiments, that the refractive power of the air is proportionable to its denſity. And ſince the denſity of the atmoſphere is as its weight directly, and its heat inverſely, the ratio of its denſity, at any given time, may be had by comparing the heights of the barometer and thermometer; and thence he concludes that this will alſo be the ratio of the refraction of the air. But Dr Smith obſerves, that, before we can depend upon the accuracy of this concluſion, we ought to examine whether heat and cold alone may not alter the refractive power of air, while its denſity continues the ſame. This, he ſays, may be tried, by heating the condenſed or rarefied air, ſhut up in the priſm, juſt before it is fixed to the teleſcope, and by obſerving whether the hair in its focus will continue to cover the ſame mark all the while that the air is cooling.

The French academicians, being informed of the reſult of the above-mentioned experiment, employed M. De l'Iſle the younger to repeat the former experiment with more care; and he preſently found, that their operators had never made any vacuum at all, there being chinks in their inſtrument, through which the air had inſinuated itſelf. He therefore annexed a gage to his inſtrument, by which means he was ſure of his vacuum; and then the reſult of the experiment was the ſame with that in England. The refraction was always in proportion to the denſity of the air, excepting when the mercury was very low, and conſequently the air very rare; in which caſe the whole quantity being very ſmall, he could not perceive much difference in them. Comparing, however, the refractive power of the atmoſphere, obſerved at Paris, with the reſult of his experiment, he found, that the beſt vacuum he could make was far ſhort of that of the etherial regions above the atmoſphere.

Dr Hooke firſt ſuggeſted the thought of making allowance for the effect of the refraction of light, in paſſing from the higher and rarer, to the lower and denſer regions of the atmoſphere, in the computed height of mountains. To this he aſcribes the different opinions of authors concerning the height of ſeveral very high hills. He could not account for the appearance of the Peak of Teneriffe, and ſeveral very high mountains, at ſo great a diſtance as that at which they are actually ſeen, but upon the ſuppoſition of the curvature of the viſual ray, that is made by its paſſing obliquely through a medium of ſuch different denſity, from the top of them to the eye, very far diſtant in the horizon. All calculations of the height of mountains that are made upon the ſuppoſition that the rays of light come from the tops of them, to our eyes, in ſtraight lines, muſt, he ſays, be very erroneous.

Dr Hooke gives a very good account of the twinkling of the ſtars; aſcribing it to the irregular and unequal refraction of the rays of light, which is alſo the reaſon why the limbs of the ſun, moon, and planets, appear to wave or dance. And that there is ſuch an unequal diſtribution of the parts of the atmoſphere, he ſays, is manifeſt from the different degrees of heat and cold in the air. This, he ſays, will be evident by looking upon diſtant objects, over a piece of hot glaſs, which cannot be ſuppoſed to throw out any kind of exhalation from itſelf, as well as through aſcending ſteams of water.

About this time Grimaldi firſt obſerved that the coloured image of the ſun refracted through a priſm is

15 Colours diſcovered to ariſe from refraction.

always oblong, and that colours proceed from refraction.—The way in which he firſt diſcovered this was by Vitellio's experiment above mentioned, in which a piece of white paper placed at the bottom of a glaſs veſſel filled with water, and expoſed to the light of the ſun, appears coloured. However, he obſerved, that in caſe the two ſurfaces of the refracting medium were exactly parallel to each other, no colours were produced. But of the true cauſe of thoſe colours, viz. the different refrangibility of the rays of light, he had not the leaſt ſuſpicion.

16 Different refrangibility of the rays of light diſcovered by Sir Iſaac Newton.

This diſcovery was reſerved for Sir Iſaac Newton, and which occurred to him in the year 1666. At that time he was buſied in grinding optic glaſſes, and procured a triangular glaſs priſm to ſatisfy himſelf concerning the phenomena of colours. While he amuſed himſelf with this, the oblong figure of the coloured ſpectrum firſt ſtruck him. He was ſurpriſed at the great diſproportion betwixt its length and breadth; the former being about five times the meaſure of the latter. He could hardly think that any difference in the thickneſs of the glaſs or in the compoſition of it, could have ſuch an influence on the light. However, without concluding any thing *à priori*, he proceeded to examine the effects of theſe circumſtances, and particularly tried what would be the conſequence of tranſmitting the light through parts of the glaſs that were of different thickneſſes, or through holes in the window-ſhutter of different ſizes; or by ſetting the priſm on the outſide of the ſhutter, that the light might paſs through it, and be refracted before it was terminated by the hole.

He then ſuſpected that theſe colours might ariſe from the light being dilated by ſome unevenneſs in the glaſs, or ſome other accidental irregularity; and to try this, he took another priſm like the former, and placed it in ſuch a manner, as that the light, paſſing through them both, might be refracted contrariwiſe, and ſo be returned by the latter into the ſame courſe from which it had been diverted by the former. In this manner he thought that the regular effects of the firſt priſm would be deſtroyed by the ſecond; but that the irregular ones would be augmented by the multiplicity of refractions. The event was, that the light, which by the firſt priſm was diffuſed into an oblong form, was by the ſecond reduced into a circular one, with as much regularity as if it had not paſſed through either of them.

At laſt, after various experiments and conjectures, he hit upon what he calls the *experimentum crucis*, and which completed this great diſcovery. He took two boards, and placed one of them cloſe behind the priſm at the windows, ſo that the light might paſs through a ſmall hole made in it for the purpoſe, and fall on the other board, which he placed at the diſtance of about twelve feet; having firſt made a ſmall hole in it alſo, for ſome of that incident light to paſs through. He then placed another priſm behind the ſecond board, ſo that the light which was tranſmitted through both the boards might paſs through that alſo, and be again refracted before it arrived at the wall.—This being done, he took the firſt priſm in his hand, and turned it about its axis, ſo much as to make the ſeveral parts of the image caſt on the ſecond board, ſucceſſively to paſs through the hole in it, that he might obſerve to what places on the wall the ſecond priſm would refract them; and he ſaw, by the change of thoſe places, that the light tending to that end of the image towards which the refraction of the firſt priſm was made, did, in the ſecond priſm, ſuffer a refraction conſiderably greater than the light which tended to the other end. The true cauſe, therefore, of the length of the image was diſcovered to be no other, than that light is not ſimilar, or homogeneal; but that it conſiſts of rays, ſome of which are more refrangible than others: ſo that, without any difference in their incidence on the ſame medium, ſome of them ſhall be more refracted than others; and therefore, that, according to their particular degrees of refrangibility, they will be tranſmitted through the priſm to different parts of the oppoſite wall.

Since it appears from theſe experiments that different rays of light have different degrees of refrangibility, it neceſſarily follows, that the rules laid down by preceding philoſophers concerning the refractive power of water, glaſs, &c. muſt be limited to the middle kind of rays. Sir Iſaac, however, proves that the ſine of the incidence of every kind of light, conſidered apart, is to its ſine of refraction in a given ratio. This he deduces, both by experiment, and alſo geometrically, from the ſuppoſition that bodies refract the light by acting upon its rays in lines perpendicular to their ſurfaces.

17 Mr Dollond's diſcovery of the method of correcting the faults in refracting teleſcopes.

The moſt important diſcovery with regard to refraction ſince the time of Sir Iſaac Newton is that of Mr Dollond, who found out a method of curing the faults of refracting teleſcopes ariſing from the different refrangibility of the rays, and which had been generally thought impoſſible to be removed. Notwithſtanding the great diſcovery of Sir Iſaac Newton concerning the different refrangibility of the rays of light, he had no idea but that they were all affected in the ſame proportion by every medium, ſo that the refrangibility of the extreme rays might be determined if that of the mean ones was given. From this it would follow, as Mr Dollond obſerves, that equal and contrary refractions muſt not only deſtroy each other, but that the divergency of the colours from one refraction would likewiſe be corrected by the other, and that there could be no poſſibility of producing any ſuch thing as refraction which would not be affected by the different refrangibility of light; or, in other words, that however a ray of light might be refracted backwards and forwards by different mediums, as water, glaſs, &c. provided it was ſo done, that the emergent ray ſhould be parallel to the incident one, it would ever after be white; and conſequently, if it ſhould come out inclined to the incident, it would diverge, and ever after be coloured; and from this it was natural to infer, that all ſpherical object glaſſes of teleſcopes muſt be equally affected by the different refrangibility of light, in proportion to their apertures, of whatever materials they may be formed.

For this reaſon, Sir Iſaac Newton, and all other philoſophers and opticians, had deſpaired of bringing refracting teleſcopes to any great degree of perfection, without making them of an immoderate and very inconvenient length. They therefore applied themſelves chiefly to the improvement of the reflecting teleſcope; and the buſineſs of refraction was dropped till about the year 1747, when M. Euler, improving upon a hint of Sir Iſaac Newton's, formed a ſcheme of making object glaſſes of two materials, of different refractive powers; hoping, that by this difference, the refractions would balance one another, and thereby prevent the diſperſion of the rays that is occaſioned by the difference of refrangibility. Theſe object glaſſes were compoſed of two lenſes of glaſs with water between them. This memoir of M. Euler excited the attention of Mr Dollond. He carefully went over all M. Euler's calculations, ſubſtituting for his hypothetical laws of refraction thoſe which had been actually aſcertained by the experiments of Newton; and found, that, after this neceſſary ſubſtitution, it followed from M. Euler's own principles, that there could be no union of the foci of all kinds of colours, but in a lens infinitely large.

M. Euler did not mean to controvert the experiments of Newton: but he ſaid, that they were not contrary to his hypotheſis, but in ſo ſmall a degree as might be neglected; and aſſerted, that, if they were admitted in all their extent, it would be impoſſible to correct the difference of refrangibility occaſioned by the tranſmiſſion of the rays from one medium into another of different denſity; a correction which he thought was very poſſible, ſince he ſuppoſed it to be actually effected in the ſtructure of the eye, which in his opinion was made to conſiſt of different mediums for that very purpoſe. To this kind of reaſoning Mr Dollond made no reply, but by appealing to the experiments of Newton, and the great circumſpection with which it was known that he conducted all his inquiries.

In this ſtate of the controverſy, the friends of M. Clairaut engaged him to attend to it; and it appeared to him, that, ſince the experiments of Newton cited by Mr Dollond could not be queſtioned, the ſpeculations of M. Euler were more ingenious than uſeful.

The ſame paper of M. Euler was alſo particularly noticed by M. Klingenſtierna of Sweden, who gave a conſiderable degree of attention to the ſubject, and diſcovered that, from Newton's own principles, the reſult of the 8th experiment of the ſecond book of his Optics could not anſwer his deſcription of it.

He found, he ſays, that when light goes out of air through ſeveral contiguous refracting mediums, as through water and glaſs, and thence goes out again into air, whether the refracting ſurfaces be parallel or inclined to one another, that light, as often as by contrary refractions it is ſo corrected as to emerge in lines parallel to thoſe in which it was incident, continues ever after to be white; but if the emergent rays be inclined to the incident, the whiteneſs of the emerging light will, by degrees, in paſſing on from the place of emergence, become tinged at its edges with colours. This he tried by refracting light with priſms of glaſs, placed within a priſmatic veſſel of water.

By theorems deduced from this experiment he infers, that the refractions of the rays of *every* ſort, made out of any medium into air, are known by having the refraction of the rays of *any one* ſort; and alſo that the refraction out of one medium into another is found as often as we have the refractions out of them both into any third medium.

On the contrary, the Swediſh philoſopher obſerves, that, in this experiment, the rays of light, after paſſing through the water and the glaſs, though they come out parallel to the incident rays, will be coloured; but that the ſmaller the glaſs priſm is, the nearer will the reſult of it approach to Newton's deſcription.

This paper of M. Klingenſtierna being communicated to Mr Dollond by M. Mallet, made him entertain doubts concerning Newton's report, and determined him to have recourſe to experiment.

He therefore cemented together two plates of parallel glaſs at their edges, ſo as to form a priſmatic veſſel, when ſtopped at the ends or baſes; and the edge being turned downwards, he placed in it a glaſs priſm, with one of its edges upwards, and filled up the vacancy with clear water; ſo that the refraction of the priſm was contrived to be contrary to that of the water, in order that a ray of light, tranſmitted through both theſe refracting mediums, might be affected by the difference only between the two refractions. As he found the water to refract more or leſs than the glaſs priſm, he diminiſhed or increaſed the angle between the glaſs plates, till he found the two contrary refractions to be equal; which he diſcovered by viewing an object through this double priſm. For when it appeared neither raiſed or depreſſed, he was ſatisfied that the refractions were equal, and that the emergent rays were parallel to the incident.

Now, according to the prevailing opinion, he obſerves, the object ſhould have appeared through this double priſm in its natural colour; for if the difference of refrangibility had been in all reſpects equal in the two equal refractions, they would have rectified each other. But this experiment fully proved the fallacy of the received opinion, by ſhowing the divergency of the light by the glaſs priſm to be almoſt double of that by the water; for the image of the object, though not at all refracted, was yet as much infected with priſmatic colours, as if it had been ſeen through a glaſs wedge only, whoſe refracting angle was near 30 degrees.

This experiment is the very ſame with that of Sir Iſaac Newton's above-mentioned, notwithſtanding the reſult was ſo remarkably different; but Mr Dollond aſſures us, that he uſed all poſſible precaution and care in his proceſs; and he kept his apparatus by him, that he might evince the truth of what he wrote, whenever he ſhould be properly required to do it.

He plainly ſaw, however, that if the refracting angle of the water veſſel could have admitted of a ſufficient increaſe, the divergency of the coloured rays would have been greatly diminiſhed, or entirely rectified; and that there would have been a very great refraction without colour, as he had already produced a great diſcolouring without refraction: but the inconveniency of ſo large an angle as that of the priſmatic veſſel muſt have been, to bring the light to an equal divergency with that of the glaſs priſm whoſe angle was about 60 degrees, made it neceſſary to try ſome experiments of the ſame kind with ſmaller angles.

Accordingly, he got a wedge of plate glaſs, the angle of which was only nine degrees; and uſing it in the ſame circumſtances, he increaſed the angle of the water wedge, in which it was placed, till the divergency of the light by the water was equal to that by the glaſs; that is, till the image of the object, though conſiderably refracted by the exceſs of the refraction of the water, appeared nevertheleſs quite free from any colours proceeding from the different refrangibility of the light; and as near as he could then meaſure, the refraction by the water was about $\frac{5}{6}$ of that by the glaſs. He acknowledges, indeed, that he was not very exact in taking the meaſures, becauſe his buſineſs was not at that time to determine the exact proportions, ſo much as to ſhow that the divergency of the colours, by different ſubſtances, was by no means in proportion to the refractions, and that there was a poſſibility of refraction without any divergency of the light at all.

As theſe experiments clearly proved, that different ſubſtances made the light to diverge very differently in proportion to their general refractive power, Mr Dollond began to ſuſpect that ſuch variety might poſſibly be found in different kinds of glaſs, eſpecially as experience had already ſhown that ſome of the kinds made much better object glaſſes in the uſual way than others; and as no ſatisfactory cauſe had been aſſigned for ſuch difference, he thought there was great reaſon to preſume that it might be owing to the different divergency of the light in the ſame refractions.

His next buſineſs, therefore, was to grind wedges of different kinds of glaſs, and apply them together; ſo that the refractions might be made in contrary directions, in order to diſcover, as in the above-mentioned experiments, whether the refraction and the divergency of the colours would vaniſh together. But a conſiderable time elapſed before he could ſet about that work: for though he was determined to try it at his leiſure, for ſatisfying his own curioſity, he did not expect to meet with a difference ſufficient to give room for any great improvement of teleſcopes, ſo that it was not till the latter end of the year 1757 that he undertook it; but his firſt trials convinced him that the buſineſs deſerved his utmoſt attention and application.

He diſcovered a difference far beyond his hopes in the refractive qualities of different kinds of glaſs, with reſpect to the divergency of colours. The yellow or ſtraw-coloured foreign ſort, commonly called *Venice glaſs*; and the *Engliſh crown glaſs*, proved to be very nearly alike in that reſpect; though, in general, the crown glaſs ſeemed to make the light diverge the leſs of the two. The common Engliſh plate glaſs made the light diverge more; and the white cryſtal, or Engliſh flint glaſs, moſt of all.

It was now his buſineſs to examine the particular qualities of every kind of glaſs that he could come at, not to amuſe himſelf with conjectures about the cauſe of this difference, but to fix upon two ſorts in which it ſhould be the greateſt; and he ſoon found theſe to be the crown glaſs and the white flint glaſs. He therefore ground one wedge of white flint, of about 25 degrees; and another of crown glaſs, of about 29 degrees: which refracted very nearly alike, but their power of making the colours diverge was very different. He then ground ſeveral others of crown glaſs to different angles, till he got one which was equal, with reſpect to the divergency of the light, to that in the white flint glaſs: for when they were put together, ſo as to refract in contrary directions, the refracted light was entirely free from colours. Then meaſuring the refraction of each wedge with theſe different angles, he found that of the white glaſs to be to that of the crown glaſs nearly as two to three: and this proportion held very nearly in all ſmall angles; ſo that any two wedges made in this proportion, and applied together, ſo as to refract in a contrary direction, would refract the light without any diſperſion of the rays.

In a letter to M. Klingenſtierna, quoted by M. Clairaut, Mr Dollond ſays, that the ſine of incidence in crown glaſs is to that of its general refraction as 1 to 1.53, and in flint glaſs as 1 to 1.583.

To apply this knowledge to practice, Mr Dollond went to work upon the object glaſſes of teleſcopes; not doubting but that, upon the ſame principles on which a refracted colourleſs ray was produced by priſms, it might be done by lenſes alſo, made of ſimilar materials. And he ſucceeded, by conſidering, that, in order to make two ſpherical glaſſes that ſhould refract the light in contrary directions, the one muſt be concave and the other convex; and as the rays are to converge to a real focus, the exceſs of refraction muſt evidently be in the convex lens. Alſo, as the convex glaſs is to refract the moſt, it appeared from his experiments, that it muſt be made of crown glaſs, and the concave of white flint glaſs. Farther, As the refractions of ſpherical glaſſes are in an inverſe ratio of their focal diſtances, it follows, that the focal diſtances of the two glaſſes ſhall be inverſely as the ratios of the refractions of the wedges; for being thus proportioned, every ray of light that paſſes through this combined glaſs, at whatever diſtance it may paſs from its axis, will conſtantly be refracted, by the difference between two contrary refractions, in the proportion required; and therefore the different refrangibility of the light will be entirely removed.

Notwithſtanding our author had theſe clear grounds in theory and experiment to go upon, he found that he had many difficulties to ſtruggle with when he came to reduce them into actual practice; but with great patience and addreſs, he at length got into a ready method of making teleſcopes upon theſe new principles.

His principal difficulties aroſe from the following circumſtances. In the firſt place, The focal diſtances, as well as the particular ſurfaces, muſt be very nicely proportioned to the denſities or refracting powers of the glaſſes, which are very apt to vary in the ſame ſort of glaſs made at different times. Secondly, The centres of the two glaſſes muſt be placed truly in the common axis of the teleſcope, otherwiſe the deſired effect will be in a great meaſure deſtroyed. Add to theſe, that there are four ſurfaces to be wrought perfectly ſpherical; and any perſon, he ſays, but moderately practiſed in optical operations, will allow, that there muſt be the greateſt accuracy throughout the whole work. At length, however, after numerous trials, and a reſolute perſeverance, he was able to conſtruct refracting teleſcopes, with ſuch apertures and magnifying powers, under limited lengths, as, in the opinion of the beſt judges, far exceeded any thing that had been produced before, repreſenting objects with great diſtinctneſs, and in their true colours.

It was objected to Mr Dollond's diſcovery, that the ſmall diſperſion of the rays in crown glaſs is only apparent, owing to the opacity of that kind of glaſs, which does not tranſmit the fainter coloured rays in a ſufficient quantity; but this objection is particularly conſidered, and anſwered by M. Beguelin.

As Mr Dollond did not explain the methods which he took in the choice of different ſpheres proper to deſtroy the effect of the different refrangibility of the rays of light, and gave no hint that he himſelf had any rule to direct himſelf in it; and as the calculation of the diſperſion of the rays, in ſo complicated an affair, is very delicate; M. Clairaut, who had given a good deal of attention to this ſubject, from the beginning of the controverſy, endeavoured to make out a complete theory of it.

Without ſome aſſiſtance of this kind, it is impoſſible, ſays this author, to conſtruct teleſcopes of equal goodneſs with thoſe of Mr Dollond, except by a ſervile imitation of his; which, however, on many accounts, would be very unlikely to anſwer. Beſides, Mr Dollond only gave his proportions in general, and pretty near the truth; whereas the greateſt poſſible preciſion is neceſſary. Alſo the beſt of Mr Dollond's teleſcopes were far ſhort of the Newtonian ones (A); whereas it might be expected that they ſhould exceed them, if the foci of all the coloured rays could be as perfectly united after refraction through glaſs, as after reflection from a mirror; ſince there is more light loſt in the latter caſe than in the former.

With a view, therefore, to aſſiſt the artiſt, he endeavoured to aſcertain the refractive power of different kinds of glaſs, and alſo their property of ſeparating the rays of light by the following exact methods. He made uſe of two priſms placed cloſe to one another, as Mr Dollond had done: but, inſtead of looking through them, he placed them in a darkened room; and when the image of the ſun, tranſmitted through them, was perfectly white, he concluded that the different refrangibility of the rays was corrected.

In order to aſcertain with more eaſe the true angles that priſms ought to have to deſtroy the effect of the difference of refrangibility, he conſtructed one which had one of its ſurfaces cylindrical, with ſeveral degrees of amplitude. By this means, without changing his priſms, he had the choice of an infinity of angles; among which, by examining the point of the curve ſurface which receiving the ſolar ray, gave a white image, he could eaſily find the true one.

He alſo aſcertained the proportion in which different kinds of glaſs ſeparated the rays of light, by meaſuring, with proper precautions, the oblong image of the ſun made by tranſmitting a beam of light through them. In making theſe experiments, he hit upon an eaſy method of convincing any perſon of the greater refractive power of Engliſh flint glaſs above the common French glaſs, both with reſpect to the mean refraction, and the different refrangibility of the colours; for having taken two priſms, of theſe two kinds of glaſs, but equal in all other reſpects, and placed them ſo that they received, at the ſame time, two rays of the ſun, with the ſame degree of incidence, he ſaw, that of the two images, that which was produced by the Engliſh flint glaſs was a little higher up on the wall than the other, and longer by more than one half.

M. Clairaut was aſſiſted in theſe experiments by M. De Tournieres, and the reſults agreed with Mr Dollond's in general; but whereas Mr Dollond had made the diſperſion of the rays in glaſs and in water to be as five to four (acknowledging, however, that he did not pretend to do it with exactneſs), theſe gentlemen, who took more pains, and uſed more precautions, found it to be as three to two. For the theorems and problems deduced by M. Clairaut from theſe new principles of optics, with a view to the perfection of teleſcopes, we muſt refer the reader to *Mem. Acad. Par.* 1756, 1757.

The labours of M. Clairaut were ſucceeded by thoſe of M. D'Alembert, which ſeem to have given the makers of theſe achromatic teleſcopes all the aid that calculations can afford them. This excellent mathematician has likewiſe propoſed a variety of new conſtructions of theſe teleſcopes, the advantages and diſadvantages of which he diſtinctly notes; at the ſame time that he points out ſeveral methods of correcting the errors to which they are liable: as by placing the object glaſſes, in ſome caſes, at a ſmall diſtance from one another, and ſometimes by uſing eye glaſſes of different refractive powers; which is an expedient that ſeems not to have occured to any perſon before him. He even ſhows, that teleſcopes may be made to advantage, conſiſting of only one object glaſs, and an eye glaſs of a different refractive power. Some of his conſtructions have two or more eye glaſſes of different kinds of glaſs. This ſubject he conſidered at large in one of the volumes of his *Opuſcules Mathematiques*. We have alſo three memoirs of M. D'Alembert upon this ſubject, among thoſe of the French Academy; one in the year 1764, another in 1765, and a third in 1767.

At the concluſion of his ſecond memoir he ſays, that he does not doubt, but, by the different methods he propoſes, achromatic teleſcopes may be made to far greater degrees of perfection than any that have been ſeen hitherto, and even ſuch as is hardly credible: And though the crown glaſs, by its greeniſh colour, may abſorb ſome part of the red or violet rays, which, however, is not found to be the caſe in fact; that objection cannot be made to the common French glaſs, which is white, and which on this account he thinks muſt be preferable to the Engliſh crown glaſs.

Notwithſtanding Meſſrs Clairaut and D'Alembert ſeemed to have exhauſted the buſineſs of calculation on the ſubject of Mr Dollond's teleſcopes, no uſe could be made of their labours by foreign artiſts. For ſtill the teleſcopes made in England, according to no exact

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(A) This aſſertion of M. Clairaut might be true at the time that it was made, but it is by no means ſo at preſent.

rule, as foreigners ſuppoſed, were greatly ſuperior to any that could be made elſewhere, though under the immediate direction of thoſe able calculators. For this M. Beguelin aſſigned ſeveral reaſons. Among others, he thought that their geometrical theorems were too general, and their calculations too complicated, for the uſe of workmen. He alſo thought, that in conſequence of neglecting ſmall quantities, which theſe calculators profeſſedly did, in order to make their algebraical expreſſions more commodious, their concluſions were not ſufficiently exact. But what he thought to be of the moſt conſequence, was the want of an exact method of meaſuring the refractive and diſperſing powers of the different kinds of glaſs; and for want of this, the greateſt preciſion in calculation was altogether uſeleſs.

Theſe conſiderations induced this gentleman to take another view of this ſubject; but ſtill he could not reconcile the actual effect of Mr Dollond's teleſcopes with his own concluſions: ſo that he imagined, either that he had not the true refraction and diſperſion of the two kinds of glaſs given him; or elſe, that the aberration which ſtill remained after his calculations, muſt have been deſtroyed by ſome irregularity in the ſurfaces of the lenſes. He finds ſeveral errors in the calculations both of M. D'Alembert and Clairaut, and concludes with expreſſing his deſign to purſue this ſubject much farther.

M. Euler, who firſt gave occaſion to this inquiry, which terminated ſo happily for the advancement of ſcience, being perſuaded both by his reaſoning and calculations, that Mr Dollond had diſcovered no new principle in optics, and yet not being able to controvert Mr Short's teſtimony in favour of the goodneſs of his teleſcopes, concluded that this extraordinary effect was owing, in part, to the crown glaſs not tranſmitting all the red light, which would otherwiſe have come to a different focus, and have diſtorted the image; but principally to his happening to hit on a juſt curvature of his glaſs, which he did not doubt would have produced the ſame effect if his lenſes had all been made of the ſame kind of glaſs. In another place he imagines that the goodneſs of Mr Dollond's teleſcope might be owing to the eye glaſs. If my theory, ſays he, be true, this diſagreeable conſequence follows, that Mr Dollond's object glaſſes cannot be exempt from the diſperſion of colours: yet a regard to ſo reſpectable a teſtimony embarraſſes me extremely, it being as difficult to queſtion ſuch expreſs authority, as to abandon a theory which appears to me perfectly well founded, and to embrace an opinion, which is as contrary to all the eſtabliſhed laws of nature as it is ſtrange and ſeemingly abſurd. He even appeals to experiments made in a darkened room; in which, he ſays, he is confident that Mr Dollond's object-glaſſes would appear to have the ſame defects that others are ſubject to.

Not doubting, however, but that Mr Dollond, either by chance, or otherwiſe, had made ſome conſiderable improvement in the conſtruction of teleſcopes, by the combination of glaſſes, he abandoned his former project, in which he had recourſe to different mediums, and confined his attention to the correction of the errors which ariſe from the curvature of lenſes. But while he was proceeding, as he imagined, upon the true principles of optics, of which, however, he made but little uſe, he could not help expreſſing his ſurpriſe that Mr Dollond ſhould have been led to ſo important a diſcovery by reaſoning in a manner quite contrary to the nature of things. At length, however, M. Euler was convinced of the reality and importance of Mr Dollond's diſcoveries; and very frankly acknowledges, that he ſhould perhaps never have been brought to aſſent to it, had not his friend M. Clairaut aſſured him that the experiments of the Engliſh optician might be depended upon. However, the experiments of M. Zeiher of Peterſburgh gave him the moſt complete ſatiſfaction with reſpect to this new law of refraction.

This gentleman demonſtrated, that it is the lead in the compoſition of glaſs that gives it this remakable property, that while the refraction of the mean rays is nearly the ſame, that of the extremes differs conſiderably. And, by increaſing the quantity of lead in the mixture, he produced a kind of glaſs, which occaſioned a much greater ſeparation of the extreme rays than the flint glaſs which Mr Dollond had made uſe of. By this evidence M. Euler owns that he was compelled to renounce the principle which, before this time, had been conſidered as inconteſtable, *viz.* that the diſperſion of the extreme rays depends upon the refraction of the mean: and that the former varies with the quality of the glaſs, while the latter is not affected by it.

From theſe new principles M. Euler deduces theorems concerning the combination of the lenſes, and, in a manner ſimilar to M. Clairaut and D'Alembert, points out methods of conſtructing achromatic teleſcopes.

18 Different compoſitions of glaſs for the purpoſe of correcting the faults of refracting teleſcopes.

While he was employed upon this ſubject, he informs us, that he received a letter from M. Zeiher, dated Peterſburgh 30th of January 1764, in which he gives him a particular account of the ſucceſs of his experiments on the compoſition of glaſs; and that, having mixed minium and ſand in different proportions, the reſult of the mean refraction and the diſperſion of the rays varied according to the following table.

Proportion of minium to flint.	Mean refraction from air into glaſs.	Diſperſion of the rays in compariſon of crown glaſs.
I. — 3 : 1	2028 : 1000	4800 : 1000
II. — 2 : 1	1830 : 1000	3550 : 1000
III. — 1 : 1	1787 : 1000	3259 : 1000
IV. — $\frac{3}{4}$: 1	1732 : 1000	2207 : 1000
V. — $\frac{1}{2}$: 1	1724 : 1000	1800 : 1000
VI. — $\frac{1}{4}$: 1	1664 : 1000	1354 : 1000

By this table it is evident, that a greater quantity of lead not only occaſions a greater diſperſion of the rays, but alſo conſiderably increaſes the mean refraction. The firſt of theſe kinds of glaſs, which contains three times as much minium as flint, will appear very extraordinary; ſince, hitherto, no tranſparent ſubſtance has been known, whoſe refractive power exceeded the ratio of two to one, and that the diſperſion occaſioned by this glaſs is almoſt five times as great as that of crown claſs, which could not be believed by thoſe who entertained

Ombre

Omelet.

called *beaſts*. And if the ombre wins all the nine tricks, it is called *winning the vole*.

In ombre by five, which many, on account of its not requiring ſo cloſe an attention, prefer to that by three, only eight cards a-piece are dealt; and five tricks muſt be won, otherwiſe the ombre is beaſted. Here the perſon who undertakes the game, after naming the trump, calls a king to his aſſiſtance; upon which the perſon in whoſe hand the king is, without diſcovering himſelf, is to aſſiſt him as a partner, and to ſhare his fate. If, between both, they can make five tricks, the ombre wins two counters, and the auxiliary king only one; but when the counters are even, they divide them equally. If the ombre venture the game without calling in any king, this too is called *playing ſans prendre;* in which caſe the other four are all againſt him, and he muſt win five tricks alone, or be beaſted. The reſt is much the ſame as by three.

Ombre de ſoleil, "Shadow of the ſun," in heraldry, is when the ſun is borne in armory, ſo as that the eyes, noſe, and mouth, which at other times are repreſented, do not appear; and the colouring is thin, ſo that the field can appear through it.

OMBRIA, the ancient name of a province of Italy, in the territory of the pope, now called *Spoletto* and *Perugia*.

OMBRO, or Lombro, a town of Italy, in the duchy of Tuſcany, and territory of the Siennois, ſituated near the Tuſcan ſea, a little ſouth of the lake of Caſtiglione, 45 miles ſouth-weſt of Sienna.

OMBROMETER, a machine to meaſure the quantity of rain that falls. We have the deſcription and ſign of one in Phil. Tranſ. N° 473. p. 12. It conſiſts of a tin funnel, whoſe ſurface is an inch ſquare, with a flat board, and a glaſs tube ſet into the middle of it in a groove. The riſe of the water in the tube, whoſe capacity at different times muſt be meaſured and marked, ſhows the quantity of rain that has fallen.

OMELET, or Amlet, a kind of pancake or fricaſſee of eggs, with other ingredients, very uſual in Spain and France. It may be made as follows: The eggs being beaten, are to be ſeaſoned with ſalt and pepper, and then fried in butter made boiling hot; this done, gravy is to be poured on, and the whole ſtewed with chives and parſley ſhred ſmall: when one ſide is fried enough, it is to be turned on the other.

Omen.

OMEN, is a word which, in its proper ſenſe, ſignifies a ſign or indication of ſome future event taken from the language of a perſon ſpeaking without any intent to prophecy. Hence Tully ſays, "Pythagorei non ſolum voces deorum obſervarunt, ſed etiam hominum, quæ vocent *omina;*" "the Pythagoreans attend to the diſcourſe not only of gods, but alſo of men, which they call *omens*." This ſort of omen was ſuppoſed to depend much upon the will of the perſon concerned in the event; whence the phraſes *accepit omen, arripuit omen*. Such were the original *omens;* but they were afterwards derived from *things* as well as from words. Thus Paterculus, ſpeaking of the head of Sulpicius on the roſtrum, ſays it was *velut omen imminentis proſcriptionis*, "the omen of an impending proſcription." Suetonius ſays of Auguſtus, that he believed implicitly in certain omens; and that, *ſi manè ſibi calceus perperam, ac ſiniſter pro dextero induceretur, ut dirum*, "if his ſhoes were improperly put on in the morning, eſpecially if the left ſhoe was put upon his right foot, he held it for a bad omen." Omen was uſed in a ſtill larger ſenſe, to ſignify an *augury;* as in the following line of Tully: "Sic aquilæ clarum firmavit Jupiter *omen;*" "thus Jove confirmed the bright omen of the eagle." It was laſtly uſed, in the moſt generic ſenſe of all, for a portent or prodigy; as in the third book of the Æneid, where a myrtle torn up by Æneas dropped blood. Upon this appearance, ſays the hero,

> Mihi frigidus horror
> Membra quatit, gelidusque coit formidine ſanguis.

And the ſame thing being repeated upon his breaking a branch from another tree, he prayed to the gods to avert the *omen*.

> Multa movens animo Nymphas venerabar agreſtes,
> Gradivumque patrem, Geticis qui præſidet arvis,
> Rite ſecundarent viſus, *omen*que levarent (A).

Theſe portentous or ſupernatural omens were either external or internal. Of the former ſort were thoſe ſhowers of blood ſo frequently occurring in the Roman hiſtory, which were much of the ſame nature with this adventure of Æneas, which he calls monstra deum. Of the ſecond ſort were thoſe ſudden conſternations, which, ſeizing upon men without any viſible cauſe, were imputed to the agency of the god *Pan*, and hence called *panic fears*. But indeed there was hardly

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(A) Inſtead of tranſlating theſe ſhort quotations, we ſhall here give Dryden's verſion of the whole of this portentous adventure, as we are perſuaded that the mere Engliſh reader, who alone can wiſh for a tranſlation, will be glad to have the fulleſt account of the bleeding myrtle, together with its effects on the mind of the hero. It is as follows:

> Not far, a riſing hillock ſtood in view;
> Sharp myrtles on the ſides and corners grew.
> There, while I went to crop the ſylvan ſcenes,
> And ſhade our altar with their leafy greens,
> I pull'd a plant (with horror I relate
> A prodigy ſo ſtrange, and full of fate):
> The rooted fibres roſe; and from the wound
> Black bloody drops diſtill'd upon the ground.
> Mute and amaz'd, my hair with terror ſtood;
> Fear ſhrunk my ſinews, and congeal'd my blood.
> Mann'd once again, another plant I try;
> That other guſh'd with the ſame ſanguine dye.
> Then, fearing guilt for ſome offence unknown,
> With prayers and vows the Dryads I atone,
> With all the ſiſters of the woods, and moſt
> The God of arms, who rules the Thracian coaſt:
> That they, or he, theſe omens would avert,
> Releaſe our fears, and better ſigns impart.

hardly any thing, however trivial from which the ancients did not draw omens. That it ſhould have been thought a direful omen when any thing befel the temples, altars, or ſtatues of the GODS, need excite no wonder; but that the meeting of a eunuch, a negro, a bitch with whelps, or a ſnake lying in the road, ſhould have been looked upon as portending bad fortune, is a deplorable inſtance of human weakneſs, and of the pernicious influence of ſuperſtition on the mind.

It is more than probable that this practice of making ordinary events ominous of good or bad fortune took its riſe in Egypt, the parent country of almoſt every ſuperſtition of paganiſm; but wherever it may have ariſen, it ſpread itſelf over the whole inhabited globe, and at this day prevails in a greater or leſs degree among the vulgar of all nations.

In England, is is reckoned a good omen, or a ſign of future happineſs, if the ſun ſhines on a couple coming out of the church after having been married. It is alſo eſteemed a good ſign if it rains whilſt a corpſe is burying:

> Happy is the bride that the ſun ſhines on;
> Happy is the corpſe that the rain rains on.

To break a looking glaſs is extremely unlucky; the party to whom it belongs will loſe his beſt friend.

If, going a journey on buſineſs, a ſow croſs the road, you will probably meet with a diſappointment, if not a bodily accident, before you return home. To avert this, you muſt endeavour to prevent her croſſing you; and if that cannot be done, you muſt ride round on freſh ground. If the ſow is attended with her litter of pigs, it is lucky, and denotes a ſucceſsful journey.

It is unlucky to ſee firſt one magpye, and then more; but to ſee two, denotes marriage or merriment; three, a ſucceſsful journey; four an unexpected piece of good news; five, you will ſhortly be in a great company. To kill a magpye, will certainly be puniſhed with ſome terrible misfortune.

If, in a family, the youngeſt daughter ſhould be married before her elder ſiſters, they muſt all dance at her wedding without ſhoes: this will counteract their ill luck, and procure them huſbands.

If you meet a funeral proceſſion, or one paſſes by you, always take off your hat: this keeps all evil ſpirits attending the body in good humour.

If, in eating, you miſs your mouth, and the victuals fall, it is very unlucky, and denotes approaching ſickneſs.

It is lucky to put on a ſtocking the wrong ſide outwards: changing it alters the luck.

When a perſon goes out to tranſact any important buſineſs, it is lucky to throw an old ſhoe after him.

It is unlucky to preſent a knife, ſciſſars, razor, or any ſharp or cutting inſtrument, to one's miſtreſs or friend, as they are apt to cut love and friendſhip. To avoid the ill effects of this, a pin, a farthing, or ſome trifling recompenſe, muſt be taken. To find a knife or razor, denotes ill luck and diſappointment to the party.

In the Highlands of Scotland, it is thought unlucky if a perſon ſetting out upon a journey ſtumble over the threſhold, or be obliged to return for any thing forgotten. If a ſportſman ſee any perſon ſtepping over his gun or fiſhing rod, he expects but little ſucceſs in that day's diverſion. *Sneezing* is alſo deemed ominous. If one ſneeze when making a bed, a little of the ſtraw or heath is taken out and thrown into the fire, that nothing may diſturb the reſt of the perſon who is to ſleep in the bed. Among the ſame people, ſucceſs in any enterpriſe is believed to depend greatly upon the firſt creature that preſents itſelf after the enterpriſe is undertaken. Thus, upon going to ſhoot, it is reckoned lucky to meet a horſe, but very unfortunate to ſee a hare, if ſhe eſcape; and upon meeting any creature deemed unlucky, the beſt means of averting the omen is to roll a ſtone towards it. The Greeks attributed the ſame efficacy to the rolling of a ſtone, though they greatly preferred *killing* the ominous animal, that the evil portended might fall on its own head *.

The motions and appearances of the clouds were not long ago conſidered as certain ſigns by which the ſkilful Highlander might attain to the knowledge of futurity. On the evening before *new year's day*, if a black cloud appeared in any part of the horizon, it was thought to prognoſticate a plague, a famine, or the death of ſome great man in that part of the country over which it ſhould appear to ſet; and in order to aſcertain the place threatened by the omen, the motions of this cloud were often watched through the whole night, if it happened to continue ſo long viſible above the horizon.

By the believers in this ſuperſtition there are days, as well as words and events, which are deemed ominous of good or bad fortune. The firſt day of every quarter, midſummer, and new year's day, are reckoned the moſt fortunate days in the year for accompliſhing any deſign. In the Iſle of Mull, ploughing, ſowing, and reaping, are always begun on *Tueſday*, though the moſt favourable weather for theſe purpoſes be in this way frequently loſt. That day of the week on which the third of May falls, is deemed unlucky throughout the whole year. In Morven, none will upon any account dig peat or turf for fuel on *Friday*; and it is reckoned unlucky to number the people or cattle belonging to any family, and doubly ſo if the number be taken on Friday. The age of the moon is alſo much attended to by the vulgar Highlanders. It it alleged, that during the increaſe things have a tendency to grow and ſtick together: and hence, in the Iſle of Sky, fences, which are there made of turf, are built only at that time; whilſt turf or peat for fuel are never, even in the moſt favourable weather, either made or ſtacked up but while the moon is in its wane. An opinion prevails in ſome places, that if a houſe take fire during the increaſe of the moon, the family to which it belongs will proſper in the world: but that if the fire happen while the moon is in the decreaſe, the family will from that time decline in its circumſtances, and ſink into poverty.

In attributing ſuch influence to the moon, the ſuperſtitious Highlanders have the honour to agree with the philoſophic Virgil, who in his Georgics gives the following ſage inſtructions to the huſbandman:

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* See *Potter's Antiquities*, Vol. I. p. 346.

Ipſa dies alios alio dedit ordine Luna
Felices, operum. Quintam fuge:

* * * *

Septima poſt decimam felix et ponere vitem,
Et prenſos domitare boves, et licia telæ
Addere: nona fugæ melior, contraria furtis.

The lucky days in each revolving moon
For labour chooſe: the *fifth* be ſure to ſhun.

* * * *

The *ſeventh* is next the *tenth*, the beſt to join
Young oxen to the yoke, and plant the vine.
Then weavers ſtretch your ſtays upon the weft:
The *ninth* is good for travel, bad for theft.

Dryden.

From this coincidence of the ſuperſtition of the Roman poet with that of the natives of Mull and Morven, we are ſtrongly inclined to adopt the hypotheſis of the gentleman who favoured us with this accurate account of Highland omens. He juſtly obſerves, that this ſuperſtitious practice of auguring good or ill from trifling events, and from the particular phaſes of the moon, has no connexion whatever with popiſh prieſtcraft: he ſhows that the Romiſh clergy, even in the darkeſt age, were at pains to eradicate it as idle and impious; and he therefore infers, that it muſt be a relick of Druidiſm handed down by tradition from an era prior to the introduction of Chriſtianity into the Highlands and iſles of Scotland. That the Druids were acquainted with the particular doctrines of Pythagoras has been ſhown elſewhere (ſee Druids); that Virgil was no ſtranger to the Pythagorean philoſophy is known to every ſcholar; that Pythagoras and his followers were addicted to the dotages of Magic has been made apparent in that article; and therefore it appears to us probable at leaſt, that the attention paid to pretended omens, not only in the Highlands, but alſo in the low country of Scotland, and indeed among the vulgar in every country of Europe, is a remnant of one of the many ſuperſtitions which the Druids impoſed upon their deluded followers. That it is contrary to every principle of ſound philoſophy, all philoſophers will readily acknowledge; and whoever has ſtudied the writings of St Paul muſt be convinced that it is inconſiſtent with the ſpirit of genuine Chriſtianity.

OMENTUM, or [illegible], the *Cawl*, in anatomy, a membranaceous part, uſually furniſhed with a large quantity of fat; being placed under the peritonæum, and immediately above the inteſtines. See Anatomy, N° 90.

OMER, in Jewiſh antiquity. See Corus.

St OMER's, a ſtrong, fortified, large, and populous town of France, in Artois, and capital of a conſiderable bailiwick, with a caſtle and a biſhop's ſee. It is a fortreſs of conſiderable importance, and ſurrounded on one ſide with a large moraſs; and about it there are many ſluices, which ſerve to carry the water off when it is overflowed; and in the midſt of the moraſs there is a ſort of floating iſlands covered with verdure and trees. The cathedral is a handſome ſtructure; and there are other fine buildings, with a rich Benedictine abbey. The French became maſters of this place in 1679. It is ſeated on the river Aa, and on the ſide of a hill, eight miles north-weſt of Aire, and 135 north of Paris. E. Long. 2. 20. N. Lat. 54. 45.

OMOA, a Spaniſh town and fortification on the ſouth ſide of the bay of Honduras, N. Lat. 15. 50. W. Long. 89. 50. from London. It is the key to the bay; and ſuch is the depth of the water, that ſhips of any burden may ride in the harbour with ſafety. It is a place of the utmoſt importance to Spain, as the regiſter ſhips to and from Guatimala are ſent to it in the time of war. The town was firſt eſtabliſhed in 1751, under the command of Don Joſeph Antonio de Palmo. At that period the inhabitants were about 20 white men, 60 mulattoes and free negroes, and 200 ſlaves to the king of Spain; and the military force conſiſted of about 30 ſoldiers, beſides officers. The fort was originally compoſed of ſand confined in boarded coffers, and faced with half-burnt bricks. It was defended by 12 fine braſs 24 pounders mounted, four or five iron guns of different bores, and ſome field-pieces. The Spaniards, ſenſible of the importance of the place, afterwards fortified it at an incredible expence, the ſtone of which the walls are built having been raiſed from the ſea, and brought from the diſtance of 20 leagues. The outworks were not completely finiſhed in the year 1779, though 1000 men had then been employed upon them for 20 years.

Towards the end of that year an expedition was undertaken againſt this fortreſs, in conſequence of one formed by the Spaniards againſt the Britiſh logwood cutters in the bay of Honduras and on the Moſquito ſhore. The latter, finding themſelves hard preſſed by their enemies, applied to General Dulling governor of Jamaica for aſſiſtance; who accordingly ſent a detachment to their relief under Captain Dalrymple, with neceſſary ſupplies of arms, ammunition, and artillery. Before their arrival, however, the Spaniards had taken poſſeſſion of St George's Key, the chief ſettlement of the Britiſh in theſe parts, which they plundered, and took a number of priſoners; but thoſe who eſcaped, being joined by a body of their countrymen, retook it, and forced the enemy to retire. In the mean time Captain Dalrymple, who had been informed of the loſs of the place, was haſtening to the relief of the inhabitants, and in his way fell in with Admiral Parker, who was in queſt of ſome regiſter ſhips; but which, retreating into the harbour of Omoa, were too ſtrongly protected by the fort there to be attacked by ſea. As the Spaniards, however, had now been compelled to abandon St George's Key, it was propoſed to unite the Britiſh forces by ſea and land, and to attempt the conqueſt of this fortreſs. As the force under Captain Dalrymple was too inconſiderable to attempt the fort by land, it was augmented by the marines of the ſquadron and a ſtrong party of the ſettlers; though, after all, it did not exceed the number of the garriſon who oppoſed them.

The troops were landed at about nine miles diſtance from the fort in the duſk of the evening, with a deſign to march directly forward, in order to ſurpriſe and carry it by eſcalade in the night-time. No roads, however, being found, they were obliged to explore their way through narrow foot-paths, moraſſes, and over mountains ſo beſet with precipices, that they were obliged, in order to avoid them, to make uſe of

Omoa.

lights made of the cabbage tree In conſequence of theſe impediments they were yet at a conſiderable diſtance from the fort, when the approach of day diſcovered them to the enemy. An engagement enſued, in which the Spaniards were quickly routed and driven into the town: from whence as they continued to fire upon the Britiſh, it was found neceſſary to ſet fire to it, though very much againſt the inclination of the aſſailants.

In the mean time the ſquadron took the opportunity, while the town was in flames, to come into the bay, and approach the fort with an intention to batter it; but the garriſon returned their fire ſo briſkly, that no impreſſion could be made by that of the ſquadron, which was detained by want of wind from approaching ſufficiently near. The troops then, being maſters of the ground adjacent to the fort, erected ſeveral batteries in ſuch ſituations as were moſt proper for annoying it; but though they carried on their operations with great vigour, it was ſtill found that heavier artillery than any they poſſeſſed would be requiſite, the walls being no leſs than 18 feet in thickneſs; in conſequence of which they reſolved ſtill to attempt the place by eſcalade.

The attempt was made on the 21ſt of October, early in the morning. The troops entered the ditch, which fortunately for them happened to be dry, and fixed their ſcaling ladders againſt the walls, which were near 30 feet high. Two ſeamen mounted firſt; and, with admirable courage and preſence of mind, ſtood by the ladder which they had mounted, to guard it till others aſcended; and boldly preſented their pieces againſt a large party drawn up to receive them, though they prudently retained their fire till their comrades came up.

The ſquadron, now drawing near, kept up a heavy and continual fire upon the fort, while the Spaniards were ſtruck with ſuch ſurpriſe at the exceſſive celerity and boldneſs of the aſſailants, that they remained motionleſs and unable to oppoſe their enemies, notwithſtanding the exhortation and example of their officers. From this panic they never recovered; and while the ſeamen and ſoldiers continued to ſcale the walls with amazing quickneſs, the Spaniards never made any effort to defend themſelves. About 100 of them eſcaped over the walls on the oppoſite ſide of the fort; the remainder ſurrendered at diſcretion.

The whole of this tranſaction reflected the higheſt luſtre both on the conduct and courage of the Britiſh; and an inſtance of heroiſm is related in a Britiſh ſailor to which hiſtory affords nothing ſuperior. This man, having ſcaled the walls, had armed himſelf with a cutlaſs in each hand. Thus armed, he met with a Spaniſh officer unarmed, and juſt rouſed from ſleep. The generous tar ſcorned to take advantage of his condition, and therefore preſented him with one of his own cutlaſſes, ſaying, "You are now on a footing with me!" The officer, however, was too much ſtruck with admiration at his conduct to accept the offer, and took care to make the circumſtance ſufficiently known.—The value of the booty taken on this occaſion amounted to three millions of dollars; but the loſs moſt ſenſibly felt by the Spaniards was that of 250 quintals of quickſilver, a commodity indiſpenſably neceſſary in extracting the precious metals from their ores. They offered therefore to ranſom it at any price; but though the retention of it was far from affording a profit equal to that offered by the Spaniards, the Britiſh commanders abſolutely refuſed to part with it, on account of the advantages the enemy would derive from having the metal in their poſſeſſion. For the ſame reaſon they refuſed to accept of any ranſom for the fort, though the governor offered to lay down 300,000 dollars for it. The Spaniſh military and the inhabitants were treated with the utmoſt humanity; their perſonal effects remaining untouched: and this generoſity muſt have appeared to greater advantage, when contraſted with the behaviour of their own countrymen at Honduras, where the Britiſh were treated with remarkable ſeverity. The church plate and ornaments were reſtored, on condition that the terms of capitulation ſhould be faithfully kept.

Omoa, Omophagia.

In a ſhort time, however, it appeared that it would have been better to have accepted of a ranſom for the fort, as from circumſtances at that time it could not be retained in the poſſeſſion of Britain. A garriſon was indeed left for its defence on the departure of the Britiſh ſquadron; but as it was very inconſiderable, on account of the ſmall number of men that could be ſpared, the Spaniards quickly determined to make an attempt to regain the fort. For this purpoſe a body of 2000 men were collected, who inveſted it on the 25th of November. The Britiſh defended it with the utmoſt bravery; keeping up a conſtant fire on the enemy, and obliging them to retire for ſhelter, and take up their quarters behind a hill. Here they made preparations for an aſſault, in which their numbers left the ſucceſs, as they ſuppoſed, by no means dubious. The garriſon was therefore ſummoned to ſurrender, with a promiſe of the honours of war and a ſafe conveyance to Great Britain, denouncing at the ſame time the utmoſt vengeance in caſe of a refuſal; which being refuſed, the neceſſary preparations were made for an eſcalade.

The condition of the garriſon was now ſuch as could afford very little hope of being able to make any effectual reſiſtance. They were but 85 in number, moſt of whom were become incapable of duty either from illneſs or exceſſive fatigue. They were now alſo obliged to make one centinel anſwer for five, by ſhifting his place, and challenging as many times. There was no ſurgeon to attend the ſick and wounded; nor had they even any water but what came from a ſloop of war that lay abreaſt of the fort. In this deſperate ſituation, they reſolved, notwithſtanding the menances of the Spaniſh commander to render the place as unſerviceable as they could. For this purpoſe they ſpiked up all the guns; deſtroying the ſtores and ammunition that could not be carried off: they even locked the gates of the fort, after which they embarked without the loſs of a ſingle man. All this was performed in defiance of the large force that beſieged them; and the exploit, when duly conſidered, muſt appear not leſs a matter of aſtoniſhment than the extraordinary manner in which the fort had been taken. The officer who commanded in this remarkable retreat was Captain Hulke of the navy.

OMOPHAGIA, an ancient Greek feſtival, in honour of Bacchus, ſurnamed *Omophagos*, i. e. eater of raw fleſh. This feſtival was obſerved in the ſame manner with the other feſtivals of Bacchus, in which they counterfeited madneſs. What was peculiar to it, was, that the worſhippers uſed to eat the entrails of goats, raw and bloody, in imitation of the god, who was ſuppoſed to do the ſame thing.

OMPHACINE OIL, a viſcous brown juice extracted from green olives. With this oil the ancient *athletæ*, when going to wreſtle, anointed themſelves; and when that gymnaſtic exerciſe was over, they rolled themſelves in the ſand, which, mixing with the oil and ſweat on their bodies, conſtituted the *ſtrigmenta* ſo highly eſteemed in the cure of ſeveral diſeaſes. This precious medicine was carefully ſcraped off the body of the athleta with a kind of inſtrument ſomething like a comb, which was called *ſtrigilis*; and ſuch was the demand for the ſcrapings, that they were a very lucrative article of trade.

OMPHALE (fab. hiſt.), a queen of Lydia, daughter of Jardanus. She married Tmolus, who at his death left her miſtreſs of his kingdom. Omphale had been informed of the great exploits of Hercules, and wiſhed to ſee ſo illuſtrious a hero. Her wiſh was ſoon gratified. After the murder of Eurytus, Hercules fell ſick, and was ordered to be ſold as a ſlave, that he might recover his health and the right uſe of his ſenſes. Mercury was commiſſioned to ſell him, and Omphale bought him, and reſtored him to liberty. The hero became enamoured of his miſtreſs, and the queen favoured his paſſion, and had a ſon by him, whom ſome call Agelaus, and others Lamon. From this ſon were deſcended Gyges and Crœſus; but this opinion is different from the account which makes theſe Lydian monarchs ſpring from Alcæus, a ſon of Hercules, by one of the female ſervants of Omphale. Hercules is repreſented by the poets as ſo deſperately enamoured of the queen, that, to conciliate her eſteem, he ſpins by her ſide among her women, while ſhe covers herſelf with the lion's ſkin, and arms herſelf with the club of the hero, and often ſtrikes him with her ſandals, for the uncouth manner with which he holds the diſtaff, &c. Their fondneſs was mutual. As they once travelled together, they came to a grotto on Mount Tmolus, where the queen dreſſed herſelf in the habit of her lover, and obliged him to appear in a female garment. After they had ſupped, they both retired to reſt in different rooms, as a ſacrifice on the morrow to Bacchus required. In the night Faunus, or rather Pan, who was enamoured of Omphale, introduced himſelf into the cave. He went to the bed of the queen, but the lion's ſkin perſuaded him that it was the dreſs of Hercules; and therefore he repaired to the bed of Hercules, in hopes to find there the object of his affections. The female dreſs of Hercules deceived him, and he laid himſelf down by his ſide. The hero was awakened, and kicked the intruder into the middle of the cave. The noiſe awoke Omphale, and Faunus was diſcovered lying on the ground, greatly diſappointed and aſhamed.

OMPHALEA, in botany: A genus of the triandria order, belonging to the monœcia claſs of plants; and in the natural method ranking with thoſe of which the order is doubtful. The male calyx is tetraphyllous; there is no corolla; the receptacle, into which the antheræ are ſunk, is ovate. The female calyx and corolla are as in the male; the ſtigma trifid; the capſule carnous and trilocular, with one ſeed.

OMPHALO-MESENTERIC, in anatomy. All fœtuſes are wrapped up in at leaſt two coats or membranes; moſt of them have a third, called *allantoides*, or *urinary*.

Some, as the dog, cat, hare, &c. have a fourth, which has two blood veſſels, viz. a vein and an artery, called *omphalo-meſenterics*, becauſe paſſing along the ſtring to the navel, and terminating in the meſentery.

OMRAH, a man of the firſt rank in the Mogul empire; a nobleman. It is the plural of the Arabic *ameer*.

ON, (anc. geog.), a city of Egypt ſacred to the ſun, and by the Greeks, on that account, called *Heliopolis*. (See HELIOPOLIS.) It was remarkable for the wiſdom and learning of its prieſthood, and for the ſpacious buildings in which they cultivated the ſtudies of philoſophy and aſtronomy. The prieſts of On were eſteemed more noble than all the other prieſts of Egypt. They were always privy counſellors and miniſters of ſtate; and therefore, when Pharaoh reſolved to make Joſeph *prime* miniſter, he very wiſely gave him in marriage a daughter of the prieſt of *On*, thereby incorporating him into the moſt venerable caſt in Egypt. Biſhop Warburton thinks that the ſuperior nobility of the prieſts of *On* was chiefly owing to their high antiquity and great learning. That they were much given to the ſtudy of aſtronomy, we know from the teſtimony of Strabo; and indeed nothing is more probable than that they ſhould be attached to the ſtudy of that ſyſtem over which their god, the SUN, preſided, not only in his *moral* but alſo in his *natural* capacity. The learned prelate affirms, that "whether they received the doctrine from original tradition, or invented it at hazard (which laſt ſuppoſition he thinks more probable, though we are of a very different opinion), it is certain they taught that the Sun is in the centre of its ſyſtem, and that all the other bodies move round it in perpetual revolutions. This noble theory (he continues) came with the reſt of the Egyptian learning into Greece (being brought thither by Pythagoras, who received it from Oenuphis*, a prieſt of On); and after having given the moſt diſtinguiſhed luſtre to his ſchool, it ſunk into obſcurity, and ſuffered a total eclipſe throughout a long ſucceſſion of learned and unlearned ages; till theſe times reſtored its ancient ſplendour, and immoveably fixed it on the unerring principles of ſcience."

If it be true, as ſome philoſophers allege, that Moſes appears from the firſt chapter of Geneſis to have been acquainted with the true ſolar ſyſtem, this account of the origin of that ſyſtem is extremely improbable. As it is of no importance to the civil or religious conſtitution of a ſtate whether the ſyſtem of Ptolemy or that of Copernicus be admitted by the people, we cannot reaſonably ſuppoſe that the Jewiſh lawgiver was taught aſtronomy by a revelation from Heaven. But there can be no doubt of his knowing as much of that ſcience as the prieſts of *On*; for we know that he was inſtructed in all the wiſdom of the Egyptians; and therefore, if he held the ſun to be in the centre of the ſyſtem, it is morally certain that the ſame thing was held by that prieſthood.

ONANIA, or ONANISM, terms lately framed to denote the crime of ſelf-pollution, mentioned in Scrip-

Onania.

Onania ‖ Oneehoura and Oneehow.

ture to have been committed by Onan, and puniſhed in him with death.

This practice, however common, hath among all nations been reckoned a very great crime. In Scripture, beſides the inſtance of Onan above mentioned, we find ſelf-polluters termed *effeminate*, *unclean*, *filthy*, and *abominable*. Even the heathens, who had not the advantage of revelation, were of the ſame opinion, as appears from the following lines of Martial.

Hoc nihil eſſe putes! ſcelus eſt, mihi crede; ſed ingens
Quantum vix animo concipis ipſe tuo.

You think 'tis nothing! 'tis a crime, believe!
A crime ſo great you ſcarcely can conceive.

Dr Tiſſot has publiſhed a treatiſe on the pernicious effects of this ſhameful practice, which appears to be no leſs baneful to the mind than to the body. He begins with obſerving, that, by the continual waſte of the human body, aliments are required for our ſupport. Theſe aliments, however, require certain preparations in the body itſelf; and when by any means we become ſo altered that theſe preparations cannot be effected, the beſt aliments then prove inſufficient for the ſupport of the body. Of all the cauſes by which this morbid alteration is brought on, none is more common than too copious evacuations; and of all evacuations, that of the ſemen is the moſt pernicious when carried to exceſs. It is alſo to be obſerved, that though exceſs in natural venery is productive of very dangerous diſorders, yet an equal evacuation by ſelf-pollution, which is an unnatural way, is productive of others ſtill more to be dreaded. The conſequences enumerated by Dr Tiſſot are as follow:

1. All the intellectual faculties are weakened: the memory fails; the ideas are confuſed, and the patient ſometimes even falls into a ſlight degree of inſanity. They are continually under a kind of inward reſtleſsneſs, and feel a conſtant anguiſh. They are ſubject to giddineſs; all the ſenſes, eſpecially thoſe of ſeeing and hearing, grow weaker and weaker, and they are ſubject to frightful dreams.

2. The ſtrength entirely fails, and the growth in young perſons is conſiderably checked. Some are afflicted with almoſt continual watching, and others doſe almoſt perpetually. Almoſt all of them become hypochondriac or hyſteric, and are afflicted with all the evils which attend theſe diſorders. Some have been known to ſpit calcareous matters; and others are afflicted with coughs, ſlow fevers, and conſumptions.

3. The patients are affected with the moſt acute pains in different parts of the body, as the head, breaſt, ſtomach, and inteſtines; while ſome complain of an obtuſe ſenſation of pain all over the body on the ſlighteſt impreſſion.

4. There are not only to be ſeen pimples on the face, which are one of the moſt common ſymptoms; but even blotches, or ſuppurative puſtules, appear on the face, noſe, breaſt, and thighs; and ſometimes fleſhy excreſcences ariſe on the forehead.

5. The organs of generation are alſo affected; and the ſemen is evacuted on the ſlighteſt irritation, even that of going to ſtool. Numbers are afflicted with an habitual gonorrhœa, which entirely deſtroys the vigour of the conſtitution, and the matter of it reſembles a fetid ſanies. Others are affected with painful priapiſms, dyſuries, ſtranguries, and heat of urine, with painful tumours in the teſticles, penis, bladder, and ſpermatic cord; and impotence in a greater or leſs degree is the never-failing conſequence of this deteſtable vice.

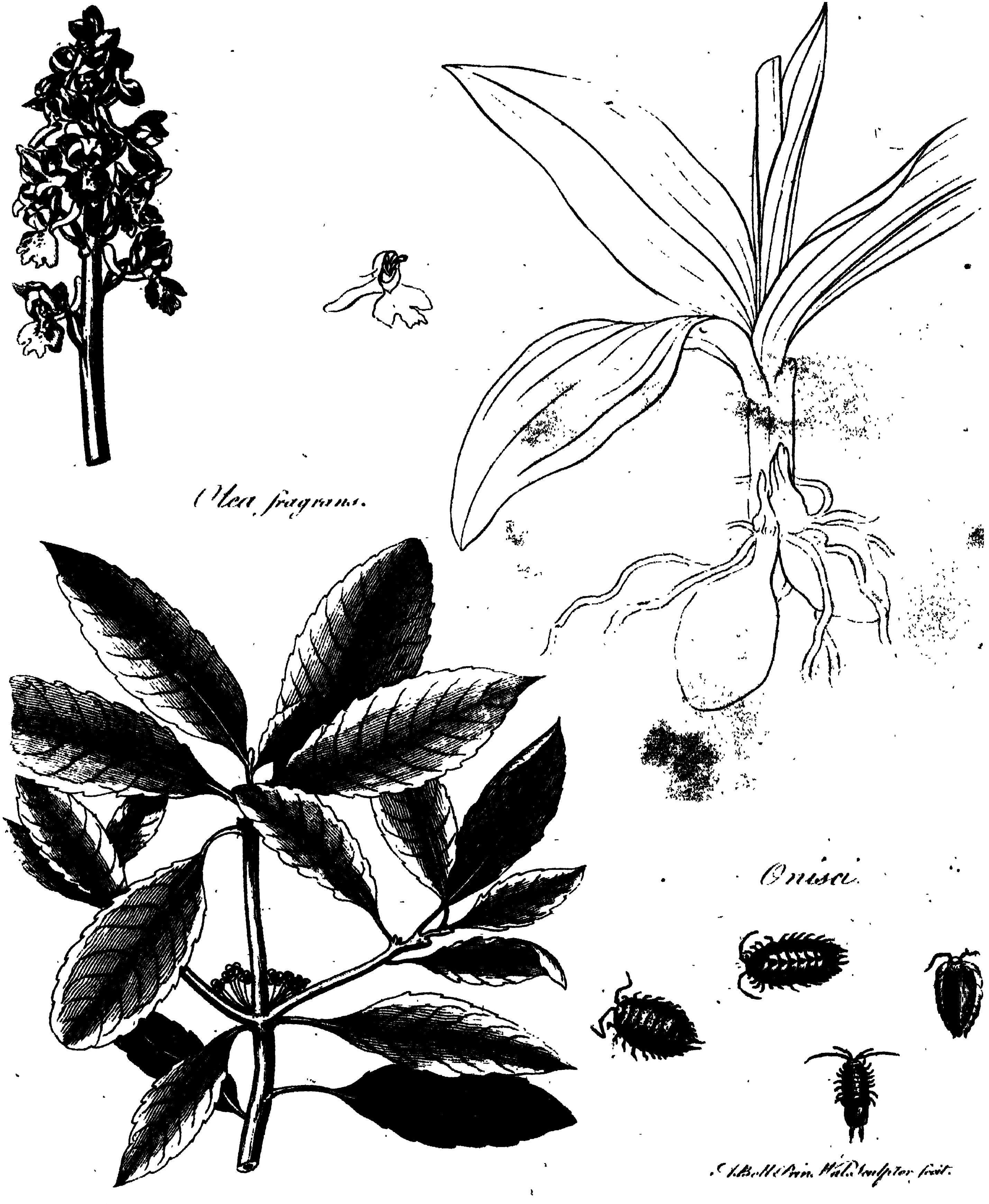
6. The functions of the inteſtines are ſometimes totally deſtroyed; and ſome patients complain of coſtiveneſs, others of diarrhœa, piles, and the running of a fetid matter from the fundament.

With regard to the cure, the firſt ſtep is to leave off thoſe practices which have occaſioned the diſeaſe; which our author aſſerts is no eaſy matter; as, according to him, the ſoul itſelf becomes polluted, and can dwell on no other idea; or if ſhe does, the irritability of the parts of generation themſelves quickly recal ideas of the ſame kind. This irritability is no doubt much more to be dreaded than any pollution the ſoul can have received; and by removing it, there will be no occaſion for exhortations to diſcontinue the practice. The principal means for diminiſhing this irritability are, in the firſt place, to avoid all ſtimulating, acrid, and ſpiced meats. A low diet, however, is improper, becauſe it would further reduce the body, already too much emaciated. The food ſhould therefore be nutritive, but plain, and ſhould conſiſt of fleſh rather roaſted than boiled, rich broths, &c. It is certain, however, that as theſe foods contribute to reſtore the ſtrength of the body, the ſtimulus on the organs of generation will be proportionably increaſed by the ſemen which is conſtantly ſecreted, and which will now be in larger quantity than even in healthy perſons, owing to the great evacuations of it which have preceded. Some part of the ſemen is gradually abſorbed by the lymphatics; in conſequence of which, the remainder becomes thick, acrid, and very ſtimulating. To remedy this, exerciſe is to be uſed, and that not only for pleaſure, but till it is attended with a very conſiderable degree of fatigue. The ſleep alſo muſt be no more than is barely ſufficient to repair the fatigue occaſioned by the exerciſe, or other employment; for an exceſs in ſleep is as bad as idleneſs or ſtimulating foods. Exceſs in wine or intoxicating liquors is alſo to be avoided; or rather ſuch liquors ought never to be taſted, unleſs as a medicine to reſtore the exhauſted ſpirits; and to all this ought to be joined the Peruvian bark, which hath this admirable property, that, with little or no ſtimulus, it reſtores the tone of the ſyſtem, and invigorates the body in a manner incredible to thoſe who have not obſerved its effects. If theſe directions are followed, the patient may almoſt certainly expect a recovery, provided any degree of vital ſtrength remains; and thoſe who deſire a life of celibacy on a moral account, will find them much more effectual than all the vows of chaſtity they can make.

ONCA and ONCE. See FELIS, IV. and VI.

ONEEHOURA and ONEEHOW, two ſmall iſlands of that cluſter which was diſcovered by Captain Cook, and by him called the *Sandwich Iſlands*. (See SANDWICH ISLANDS). *Oneehoura* is very ſmall, and its chief produce is yams. *Oneehow* is conſiderably larger, being about ten miles over. It is remarkable for the great quantity of excellent yams, which it produces, and for a ſweet root called *tee* or *tea*, which is generally

Plate CCCXLIX.


Orchis-mascula.
Olea fragrans.
Onisci.

A. Bell Prin. Wal. Sculptor fecit.

ly about the thickneſs of a man's wriſt, though ſometimes much larger. This root, which the natives commonly bake previous to their bringing it to market, is of a wet clammy nature, and with proper management makes excellent beer.

ONEGA, a river and lake of the Ruſſian empire, between Muſcovite Carelia, the territory of Cargapol, and Swediſh Carelia. It is 100 miles in length and 40 in breadth, having a communication with the lake Ladoga, and conſequently with Peterſburgh. The river has its ſource in Cargapol, and gives its name to a country full of woods.

ONEGLIA, a ſea port town of Italy, in the territory of Genoa, with the title of a principality; but it belongs to the king of Sardinia, as well as the province, which abounds in olive trees, fruit, and wine. It has often been taken and retaken in the wars of Italy; which is no wonder, as it is an open place. The French and Spaniards had poſſeſſion of it in 1744, but were driven out by the Piedmonteſe; however, they returned next winter, and again made themſelves maſters of it. E. Long. 7. 51. N. Lat. 43. 58.

ONEIROCRITICA, the art of interpreting dreams; or a method of foretelling future events by means of dreams. See DREAM, DIVINATION, &c.—The word is formed from the Greek ονειρος, "dream," and κριτικη, of κρισις, "judgment."—Some call it *oneirocratica*; and derive it from ονειρος and κρατεω, "I poſſeſs, I command."

It appears from ſeveral paſſages of Scripture, that there was, under the Jewiſh diſpenſation, ſuch a thing as foretelling future events by dreams; but then there was a particular gift or revelation required for that purpoſe.

Hence it has been inferred, that dreams are really ſignificative, and do forbode ſomething to come; and all that is wanting among us is the *oneirocritica*, or the art of knowing what: yet it is the opinion of many, that dreams are mere chimeras; bearing indeed ſome relation to what has paſſed, but none to what is to come. As to the caſe of Joſeph, it was poſſible for God, who knew all things, to diſcover to him what was in the womb of fate; and to introduce that, he might take the occaſion of a dream.

ONEIROCRITICS, a title given to interpreters of dreams, or thoſe who judge of events from the circumſtances of dreams.

There is no great regard to be had to thoſe Greek books called *oneirocritics*; nor do we know why the patriarch of Conſtantinople, and others, ſhould amuſe themſelves with writing on ſo pitiful a ſubject.

Rigault has given us a collection of the Greek and Latin works of this kind; one attributed to Aſtrampſichus; another to Nicephorus, patriarch of Conſtantinople; to which are added the treatiſes of Artemidorus and Achmet. But the books themſelves are little elſe than reveries; a kind of waking dreams, to explain and account for ſleeping ones.

The ſecret of oneirocriticiſm, according to them all, conſiſts in the relation ſuppoſed to be between the dream and the thing ſignified: but they are far from keeping to the relations of agreement and ſimilitude; and frequently have recourſe to others of diſſimilitude and contrariety. Concerning oneirocritics and oneirocritica, the unlearned reader will find much information in Warburton's Divine Legation of Moſes, and the books to which he refers.

ONESIÆ THERMÆ, were, according to Strabo, *excellent baths*, and *ſalutary waters*, at the foot of the Pyrenees in Aquitania. Near the river Aturus ſtands at this day the town Bagneres, famous for its waters, which appear to be the *Oneſiæ* of Strabo; ſituated in the county of Bigorre in Gaſcony, near the river Adour.

ONIÆ OPPIDUM and *Templum*, (Joſephus); ſo called from Onias, the high-prieſt of the Jews in Egypt; who built a temple in imitation of that at Jeruſalem, by permiſſion of the king of Egypt, on the ſpot where ſtood the temple of Diana Agreſtis in Leontopolis: it was encompaſſed with a brick wall, and had a large tower like that at Jeruſalem, (Joſephus): it was the metropolis of the Nomos Heliopolites, (Ptolemy); becauſe in Strabo's time Heliopolis was fallen to decay.

ONGLEE, in heraldry, an appellation given to the talons or claws of beaſts or birds, when borne of a different colour from that of the body of the animal.

ONION. See ALLIUM, ſp. 5.—Onions, leeks, and garlic, are all of the ſame genus; and in their recent ſtate are acrid, but harmleſs to the human body. When, by age or climate, this acrimony is too great, we do not uſe them as food. In Spain, the garlic being equally mild with the onion, is uſed as common food. By the ordinary culinary preparation their acrimony is diſſipated, and a remarkably mild ſubſtance remains, promiſing much nutriment, which thoſe who can digeſt them raw will certainly obtain. Though ſometimes ſhunned as food, yet they are on that account uſed in medicine, uniting the two qualities of pectorals, viz. on the account of their acrimony, being in their recent ſtate expectorant; in their boiled ſtate, on account of their mucilage, demulcent, provided the quantity taken be ſufficient. Some of late, in this country, have found in leeks a ſomniferous quality; but this is not yet confirmed by a ſufficient number of experiments.—Beſides the three above-mentioned, there are ſeveral others belonging to the ſame tribe, which we uſe as condiment; but only the leek and onion as diet. In its recent ſtate, the onion is the moſt acrid; in its boiled ſtate, the leek retains its acrimony moſt tenaciouſly. On account of this, and ſome difference of texture, the onion is more eaſily digeſted and more univerſally uſed than the leek; being more eaſily broke down, and more generally agreeable.

Plate CCCXLIX.

ONISCUS, in zoology, a genus of inſects belonging to the order of aptera. It has 14 legs, briſtly feelers, and an oval body. There are 15 ſpecies; of which the moſt remarkable are,

1. The *entomon*, or *ſea wood-louſe*, is white; eyes black; convex above, beneath flat, margin acute; antennæ 4: Four hind pair of legs largeſt, hairy. Body of 10 ſegments. Length 1½ line. Found on the coaſt. It accompanies the herring, and is an enemy well known to our fiſhermen; theſe inſects will frequently eat up a whole fiſh while it hangs in the net.

2. *Oniſcus aquaticus*, is of an aſhen colour, and tolerably ſmooth. Its body is compoſed of ſeven articulations, excluſive of the head and tail; which laſt part

is much larger than the other ſegments, round at the extremity, and from which iſſue two appendices, each divided into two threads. This inſect has that in common with ſome ſea oniſci, but differs from them by the ſea ones having ten ſegments. This has ſeven legs on each ſide; the laſt of which gradually increaſe in length, and are conſtantly larger than the foremoſt.—The antennæ have but three long articulations, the laſt of which is much longer than the reſt. This inſect is found in pools, ſmall rivulets, and eſpecially in ſprings.

3. *Aſellus, millepes*, or *wood-louſe*, is oval; the tail obtuſe, with two undivided briſtles: various as to colour: length, five lines. Their uſe in medicine is well known.

4. *Oniſcus armadillo* is broad, very gloſſy, and ſmooth: its colour is black, with a ſmall portion of white on the edge of the ſegment, which colour often varies; but ſtill the inſect is gloſſy and ſmooth. Its body is compoſed of ten ſegments, beſides the head and tail.—Of the ten ſegments, the firſt ſeven are broad, and the laſt three ſhort. The firſt of theſe three appears divided in the middle, which is broader than the reſt, into three more. Theſe laſt ſhort ſegments, with that of the tail, form the extremity of the animal's body, which is round, without any appendix, and conſtitutes the ſpecific character of this inſect. It has fourteen feet, ſeven on each ſide. This oniſcus, when touched, rolls itſelf up into a ball, bringing its head and tail together like the animal called *armadillo*, and neither antennæ nor feet are ſeen: it might be taken for a round, ſhining pearl. This oniſcus is found in woods.

ONKELOS, ſurnamed the *Proſelyte*, a famous rabbi of the firſt century, and the author of the Chaldee Targum on the Pentateuch. He flouriſhed in the time of Jeſus Chriſt, according to the Jewiſh writers; who all agree that he was, at leaſt in ſome part of his life, contemporary with Jonathan Ben Uzziel, author of the ſecond Targum upon the prophets. Dean Prideaux thinks he was the elder of the two, for ſeveral reaſons: the chief of which is the purity of the ſtyle in his Targum, therein coming neareſt to that part of Daniel and Ezra which is in the Chaldee, and is the trueſt ſtandard of that language, and conſequently is the moſt ancient; ſince that language, as well as others, was in a conſtant flux, and continued deviating in every age from the original: nor does there ſeem to be any reaſon why Jonathan Ben Uzziel, when he undertook his Targum, ſhould paſs over the law, and begin with the prophets, but that he found Onkelos had done this work before him, and with a ſucceſs which he could not exceed.

Azarias, the author of a book entitled *Meor Enaim*, or the *light of the eyes*, tells us, that Onkelos was a proſelyte in the time of Hillel and Samnai, and lived to ſee Jonathan Ben Uzziel one of the prime ſcholars of Hillel. Theſe three doctors flouriſhed 12 years before Chriſt, according to the chronology of Gauz; who adds, that Onkelos was contemporary with Gamaliel the elder, St Paul's maſter, who was the grandſon of Hillel, who lived 28 years after Chriſt, and did not die till 18 years before the deſtruction of Jeruſalem. He the ſame Gauz, by his calculation, places Onkelos 100 years after Chriſt; and to adjuſt his opinion with that of Azarias, extends the life of Onkelos to a great length. The Talmudiſts tell us that he aſſiſted at the funeral of Gamaliel, and was at a prodigious expence to make it moſt magnificent. Dean Prideaux obſerves, that the Targum of Onkelos is rather a verſion than a paraphraſe; ſince it renders the Hebrew text word for word, and for the moſt part accurately and exactly, and is by much the beſt of all this ſort: and therefore it has always been held in eſteem among the Jews much above all the other Targums: and being ſet to the ſame muſical notes with the Hebrew text, is thereby made capable of being read in the ſame tone with it in their public aſſemblies.—From the excellency and accuracy of Onkelos's Targum, the dean alſo concludes him to have been a native Jew, ſince without being bred up from his birth in the Jewiſh religion and learning, and long exerciſed in all the rites and doctrines thereof, and being alſo thoroughly ſkilled in both the Hebrew and Chaldee languages, as far as a native Jew could be, he can ſcarce be thought thoroughly adequate to that work which he performed; and that the repreſenting him as a proſelyte ſeems to have proceeded from the error of taking him to have been the ſame with Akilas, or Aquila, of Pontus, author of the Greek Targum or verſion of the prophets and Hagiographia, who was indeed a Jewiſh proſelyte.

ONKOTOMY, in ſurgery, the opening of a tumour or abſceſs. See SURGERY.

ONOCLEA, in botany: A genus of the natural order of filices, belonging to the cryptogamia claſs of plants. The ſpike is flat, and turned to each ſide, with quinquevalved fructifications.

ONOMANCIA, or rather ONOMANTIA, a branch of divination, which foretels the good or bad fortune of a man, from the letters in his name. See the article DIVINATION, and NAME.

From much the ſame principle the young Romans toaſted their miſtreſſes as often as there were letters in their names: Hence Martial ſays,

Nævia ſex cyathis, ſeptem Juſtina bibatur.

ONOMATOPOEIA, in grammar and rhetoric, a figure where words are formed to reſemble the ſound made by the thing ſignified; as the buzz of bees, the cackling of hens, &c. Reſemblances of this kind are often fancied when they are not real, though, no doubt, there are in every language ſome words of which the ſound is very like to that which thoſe words are employed to expreſs. Yet, to the mortification of grammarians and rhetoricians, conjunctions, which have been juſtly pronounced no parts of ſpeech, are the only ſounds uttered by men that are wholly natural, and theſe are fewer than is commonly ſuppoſed. See GRAMMAR and LANGUAGE.

ONONIS, in botany: A genus of the decandria order, belonging to the diadelphia claſs of plants. The calyx is quinquepartite, with the ſegments linear; the vexillum ſtriated; the legumen turgid and ſeſſile; the filaments coalited without a fiſſure.

ONOPORDUM, in botany: A genus of the polygamia æqualis order, belonging to the ſyngeneſia claſs of plants; and in the natural method ranking under the 49th order, *Compoſitæ*. The receptacle is honeycombed; the ſcales of the calyx mucronated or pointed.

ONOSANDER, a Greek author and Platonic philoſopher, who wrote Commentaries on Plato's Politics, which are loſt: but his name is particularly famous for a treatiſe entitled Λογος Στρατηγικος, "Of the duty and virtues of the general of an army;" which has been tranſlated into Latin, Italian, Spaniſh, and French. The time when he lived is not preciſely known: but is imagined to be in the reign of the emperor Claudius.

ONOSMA, in botany: A genus of the monogynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 41ſt order, *Aſperifoliæ*. The corolla is campanulated, with the throat pervious: there are four ſeeds.

ONTARIO, a lake of North America, in the country of the Iroquois, 180 miles in length and 60 in breadth. There are many rivers that run into it; and from it the great river St Lawrence proceeds. It communicates with the lake Erie by a river 33 miles in length, in which is the remarkable cataract of NIAGARA.

ONTOLOGY. See METAPHYSICS, N° 3.

ONUPHRIUS PANVINUS, a learned Italian, of the order of hermits of St Auguſtine, was born of a noble family at Verona, in 1529; and, being trained to literature, became ſo indefatigable in his ſtudies, that he ſpent whole days and nights in reading the ancients: which made Manutius ſtyle him *Helluo Antiquitatis*. His firſt performance was a Chronicle of Popes and Cardinals, which was printed without his knowledge at Venice in 1557; and ſome time after, more correctly by himſelf. He afterwards continued Platina's Lives of the Popes, from Sixtus IV. to Pius V. and ſubjoined annotations to the lives Platina had written. He alſo wrote four pieces upon Roman Antiquities, which are printed in Grævius's Collection. He died in his 39th year, in 1568.

ONYCOMANCY, or, as ſome write it, ONYMANCY; a kind of divination by means of the nails of the fingers.——The word is formed from the Greek ονυξ, "nail," and μαντεια, "divination."

The ancient practice was to rub the nails of a youth with oil and ſoot, or wax; and to hold up the nails thus ſmeared againſt the ſun.—Upon them were ſuppoſed to appear figures or characters, which ſhowed the thing required.

ONYX, in natural hiſtory, one of the ſemipellucid gems, with variouſly coloured zones, but none red: being compoſed of cryſtal, debaſed by a ſmall admixture of earth; and made up either of a number of flat plates, or of a ſeries of coats ſurrounding a central nucleus, and ſeparated from each other by veins of a different colour, reſembling zones or belts.

We have four ſpecies of this gem. 1. A bluiſh white one, with broad white zones. 2. A very pure onyx, with ſnow-white veins. 3. The jaſponyx, or horny onyx, with green zones. 4. The brown onyx, with bluiſh white zones.

The ancients attributed wonderful properties to the onyx, and imagined that if worn on the finger it acted as a cardiac; they have alſo recommended it as an aſtringent: but at preſent no regard is paid to it.

The word in the Greek language ſignifies *nail*; the poets making this ſtone to have been formed by the Parcæ from a piece of Venus's nails, cut off by Cupid with one of his arrows.

OONALASHKA, one of the iſlands of the Northern Archipelago, viſited by Captain Cook in his laſt voyage. The native inhabitants of this iſland are, to all appearances, a very peaceable people, having been much poliſhed by the Ruſſians, who now keep them in a ſtate of ſubjection. As the iſland furniſhes them with ſubſiſtence, ſo it does, in ſome meaſure, with clothing, which is chiefly compoſed of ſkins. The upper garment, which is made like a waggoner's frock, reaches down to the knees. Beſides this, they wear a waiſtcoat or two, a pair of breeches, a fur cap, and a pair of boots, the legs of which are formed of ſome kind of ſtrong gut; but the ſoles and upper-leathers are of Ruſſia leather. Fiſh and other ſea animals, birds, roots, berries, and even ſea weed, compoſe their food. They dry quantities of fiſh during the ſummer, which they lay up in ſmall huts for their uſe in winter. They did not appear to be very deſirous of iron, nor to want any other inſtrument, except ſewing needles, their own being formed of bone. With theſe they ſew their canoes, and make their clothes, and alſo work their curious embroidery. They uſe, inſtead of thread, the fibres of plants, which they ſplit to the thickneſs required. All ſewing is performed by the females, who are ſhoemakers, tailors, and boat-builders. They manufacture mats and baſkets of graſs, which are both ſtrong and beautiful. There is indeed a neatneſs and perfection in moſt of their works, that ſhows they are deficient neither in ingenuity nor perſeverance.

Though the climate is ſometimes ſevere, Captain Cook did not obſerve a fire-place in any of their habitations. They are lighted as well as heated by lamps; which, though ſimple, effectually anſwer the purpoſe for which they are intended. They conſiſt of a flat ſtone, hollowed on one ſide like a plate; in the hollow part they put the oil, mixed with ſome dry graſs, which ſerves for a wick. Both ſexes often warm themſelves over one of theſe lamps, by placing it between their legs, under their garments, and ſitting thus over it for ſeveral minutes. E. Long. 139. 29. N. Lat. 53. 5.

OONELLA, OONEMAH, two iſlands of the ſame Archipelago with Oonalaſhka; the former of which lies to the north-eaſt of that iſland, being ſeparated from it by a navigable ſtrait; the other is more to the weſtward, being in E. Long. 192. 30. and N. Lat. 54. 30. The circumference of Oonella is about ſeven leagues, and the produce of both much the ſame with that of Oonalaſhka.

OORT (Adam Van), born at Antwerp in 1557, was the ſon of Lambert Van Oort, a painter of conſiderable reputation for perſpective and architecture. Adam was inſtructed in the art by his father, and afforded ſufficient proofs of his having an enlarged genius; ſo that he ſoon roſe into eſteem, not only as a painter of hiſtory, but as an able artiſt in landſcape and portrait. But the greateſt honour of Van Oort proceeded from his having been the firſt inſtructor of Rubens, whoſe works have eternized his maſter's memory, along with his own.

Ooſt. Naturally he was of a rough and diſagreeable temper, which occaſioned him to loſe the love of his diſciples and his friends; and among the number, he totally forfeited the eſteem of Rubens, his beſt pupil. Jordaens was the only perſon who accommodated himſelf to the ſavage humour of his maſter; but it appears probable, that he only condeſcended to endure his moroſe behaviour, out of affection to the daughter of Van Oort, to whom Jordaens was afterwards married.

In his ſtyle of painting, however, he neglected nature, and was entirely a manneriſt; nor did he ſeem to have any regard to painting as a fine art, but merely as an art that might be the means of making him rich. In his beſt time, his compoſition was agreeable and his deſign correct; but in his latter time, his works had nothing to recommend them, except the freedom of handling, and the goodneſs of their colouring; yet, with all his defects, he was accounted a good painter. Rubens uſed to ſay, that Van Oort would have ſurpaſſed all his contemporaries, if he had ſeen Rome, and formed his taſte by ſtudying after the beſt models. He painted a great number of deſigns for the altars of churches in Flanders, which have much merit in ſeveral parts; and they are ſtill beheld with pleaſure by good judges.

OOST, a kiln for drying hops after they are picked from the ſtalks.

Oost (Jaques Van), a painter of hiſtory, landſcape, and architecture, was born at Bruges about the year 1600, and learned the art in his native city, though it is not aſcertained by what maſter he was inſtructed; but he travelled to Italy to ſtudy after the works of the great maſters, and copied every thing that pleaſed his own taſte, or that he thought might contribute to his improvement. However, among all the famous artiſts, he attached himſelf particularly to the ſtyle of Annibal Caracci, and imitated him in ſuch a manner, as to ſurpriſe the moſt able connoiſſeurs at Rome.

He poſſeſſed many of the accompliſhments of a great painter. His touch and his colouring were good; he introduced but few figures in his deſigns, to avoid encumbering his ſubject; and he diſpoſed them with a great deal of ſkill and elegance; giving them ſuch draperies as were ſimple and natural. He deſigned in a good taſte; and though his ſtyle of compoſition reſembled that of Annibal, yet it was leſs charged than the deſigns of that maſter uſually are. In his carnations, his colouring was freſh and like nature; but he is not ſo commendable in the colour of his draperies, which is ſometimes ſo broken as to give the ſtuffs an appearance of hardneſs. He underſtood perſpective and architecture extremely well; and as he was not fond of painting landſcape (though occaſionally he painted it well), in the ſtead of it he ornamented his back grounds moſt frequently with buildings, columns, arches, and different pieces of architecture, which gave his compoſition a grand effect.

The moſt admired picture of Van Ooſt is in the church at Bruges which belonged to the Jeſuits: the ſubject of it is, a Deſcent from the Croſs; in which the deſign, the diſpoſition, the expreſſion, colour, and chiaro-ſcuro, are worthy of the higheſt praiſes. He had a ſon of the ſame name, who acquired conſiderable fame in his profeſſion.

Opacity, Opah. OPACITY, in philoſophy, a quality of bodies which renders them impervious to the rays of light.

Plate CCCLI. OPAH, commonly called the *king fiſh*. See Zeus. The body is deep; the ſcales exceedingly minute: it has ſetaceous teeth on the tongue only, one long dorſal fin, and a tail ſomewhat lunated. The genus of which this is a ſpecies is not numerous: This, however, is conſiderably the largeſt, and with reſpect to its colours the moſt ſplendid. It is conſidered by many as the moſt beautiful fiſh that is found on the coaſt of Europe. Mr Pennant in his Britiſh Zoology gives the following account of this fiſh, which is exceedingly rare on the Britiſh coaſt: "We have only four inſtances (ſays he) of this fiſh being taken in our ſeas, each of them in the north, viz. twice off Scotland, once off Northumberland, and once in Filey Bay, Yorkſhire. This laſt was caught about two years ago, and exhibited as a ſhow at Scarborough.

"It is of that genus which Linnæus diſtinguiſhes by the name of *Chætodon* from its briſtly teeth, and is ſaid to be very common on the coaſt of Guinea. See Chætodon. (a)

"It is well deſcribed by an anonymous writer in the London Magazine for October 1767, which we ſhall borrow, as the account is confirmed to us by Mr T who had an opportunity of examining one of the ſpecies.

"Newcaſtle, September 12. On Saturday was thrown upon the ſands at Blyth, a very rare and beautiful fiſh, weighing between 70 and 80 pounds, ſhaped like the ſea bream. The length was three feet and a half; the breadth from back to belly almoſt two feet; but the thickneſs from ſide to ſide not above ſix inches.

"The mouth ſmall for the ſize of the fiſh, forming a ſquare opening, and without any teeth in the jaws. The tongue thick, reſembling that of a man but rough and thick ſet with beards or prickles, pointing backward[illegible] that any thing might eaſily paſs down, but coul[illegible]ſily return back; therefore theſe might ſerve ſt[illegible] teeth to retain its prey. The eyes remarkably large, covered with a membrane, and ſhining with a glare of gold. The cover of the gills like the ſalmon.

"The body diminiſhes very ſmall to the tail, which is forked, and expands 12 inches: the gill fins are broad, about eight inches long, and play horizontally: a little behind their inſertion the back fin takes its original, where it is about ſeven inches high, but ſlopes away very ſuddenly, running down very near the tail, and, at its termination becomes a little broader: the belly fins are very ſtrong, and placed near the middle of the body: a narrow fin alſo runs from the anus to the tail.

(a) Later writers ſeem with more propriety to have ranked it under the genus *Zeus*, to which we have already referred.

"All the fins, and alſo the tail, are of a fine ſcarlet; but the colours and beauty of the reſt of the body, which is ſmooth and covered with almoſt imperceptible ſcales, beggars all deſcription; the upper part being a kind of bright green, variegated with whitiſh ſpots, and enriched with a ſhining golden hue, much reſembling the ſplendour of the peacock's feathers; this by degrees vaniſhes in a bright ſilver: and near the belly the gold begins again to predominate in a lighter ground than on the back."

OPAL, in natural hiſtory, a ſpecies of the chroaſtaces genus of gems.—This ſpecies of precious ſtone is generally eſteemed the moſt beautiful of all the flinty tribe, which appears to be owing to its changeable appearance when viewed by reflection.—The form of the opal is that of a pebble, like the agate, with which authors in general have claſſed it, from a ſuppoſed reſemblance of which there appears no ſort of proof. On the contrary, Bergman's analyſis points it out to be of a very different nature from the genus of flints, of which the agate is a ſpecies; magneſia conſtituting a large part of its compoſition, and not entering at all into that of the agate, if we are to judge from the analyſis of the parent ſpecies or flint, there being none yet publiſhed of agate. The ſpecific gravity of the opal is likewiſe extremely different from that of the agate. Wallerius tells us that its ſpecific gravity is upwards of 1900. It loſes its colour and tranſparency in the fire, and in other reſpects is affected by it in the very ſame manner as quartz or flint would be. It may be melted with borax, but not without great difficulty. The ſpecies are,

1. The opal of Nonnius. This appears olive-coloured by reflection, and then opaque; but when held between the eye and the light, it is found to be tranſparent, and appears of a beautiful ruby colour. Boccede Boot, author of the *Complete Jeweller*, conſiders it as the moſt precious ſort of opal, and indeed the moſt wonderful of this kind of nature's works: he gives a lofty encomium upon it, chiefly from Pliny, who called this opal *paderos*. This ſpecies of opal is the *ſangenon* of India, and *nonnius* of the ancients and modern Europeans, from the Roman ſenator Nonnius poſſeſſor of the famous opal of Rome, worth 20,000 ſeſterces, who preferred baniſhment to parting with it to Antony. An opal anſwering exactly to Pliny's deſcription of the nonnius was diſcovered about 30 or 35 years ago in the ruins of Alexandria, and purchaſed for a trifle by the French conſul Lironcourt, from his dragoman Roboly. The duke de Nivernois, when ambaſſador in London in 1763, was in poſſeſſion of the very ſtone. The next in eſteem and value is the Iris opal, of a glaſſy white colour, but when looked through it appears of a flame colour, as the nonnius does of a ruby.

Wallerius indeed is of opinion that the opal found in Alexandria was not that of Nonnius mentioned by Pliny; and adds, that it was by many ſuppoſed to be only a counterfeit piece of glaſs or paſte. There is another of the ſame ſpecies in Sweden, which by reflection appears of a browniſh colour, but by refraction is red with violet veins.

2. The white opal, having its ground of a white glaſs-like complexion, from whence green, yellow, bluiſh, and purple rays are thrown out; but when held againſt the light it appears of a reddiſh or rather flame colour. Wallerius, in his Mineralogy, ſays, that this white opal anſwers the deſcription of it given by Pliny much better than the olive-coloured one above deſcribed. There are two varieties of it: 1. The oriental opal, ſhowing many colours.—Engenſtroom informs us, that he had obtained a ſmall piece of pſeudo-agate from the Eaſt Indies, of a yellowiſh brown and pale blue, or rather milk colour, with a ſhining brightneſs exactly like that of the milky opals already mentioned; alſo ſome other ſpecimens near Turin in Piedmont, where they are called *baſtard agates*, a name which, in his opinion, is extremely proper for them, as they agree with the agates in almoſt every reſpect except hardneſs: this, however, has been controverted.—Sometimes the opal is ſurrounded with a white cruſt, like common flints in the ſtrata of chalk: which cruſt has likewiſe the ſame properties as the flint when this laſt mentioned ſubſtance has been previouſly freed from the adherent chalk; viz. 1. It does not diſſolve in nitrous acid. 2. It is not fuſible *per ſe*. 3. It melts pretty eaſily with borax, but without any efferveſcence, contrary to what is obſerved in calcareous ſubſtances; ſo that borax will diſſolve about three quarters of its own bulk of this ſubſtance, though with difficulty, eſpecially towards the end of the operation; but the glaſs becomes quite clear and colourleſs, inſtead of becoming white and opaque, as is the caſe with calcareous ſubſtances. This oriental ſtone is found in the iſland of Ceylon, where it is called the *elementary ſtone*. The Indians put as high a value on it as on the diamond. There is another kind of oriental opal much valued, generally called the *flaming opal*, becauſe it changes its colours, as if ſparks of fire eſcaped from it in parallel lines.

3. The bluiſh and ſemitranſparent opal is leſs valued by thoſe who are converſant in gems than the others, on account of its being ſuppoſed more eaſily imitable by art. M. Magellan, however, informs us, that not only this, but ſeveral other kinds of opals are eaſily imitable by art; ſeveral compoſitions of glaſs being met with which ſhow very different colours by reflection and by refraction. A curious ancient one of this kind is to be ſeen in the royal abbey of St Denis near Paris, which is green on the outſide, but ſhows a fine ruby colour when held between the eye and the light. Our author has alſo ſeen ſome glaſs paſtes made in London by Edward Delaval, Eſq; and others by Mr More ſecretary to the Society of Arts, which appeared of a yellow brown or other colour by reflection; but when held againſt the light tranſmitted a fine blue, purple, or red colour, like the ſapphires, rubies, garnets, and other precious ſtones. Wallerius gives directions for making theſe paſtes; and M. Magellan informs us, that he by chance diſcovered that the red glaſs of Kunckel, when over-melted or burnt in a common fire, produces a ſimilar effect, tranſmitting one colour by refraction and another by reflection. The fine imitations of the true white opals, which Pliny ſays were made by the Indians, have, in our author's opinion, hitherto baffled the art of the moderns.

The ſangenon or nonnius opal is found in the Eaſt Indies; the Iris, in Ceylon; the milky opal, at Eilbenſtock and Fryberg; the bluſh or moſt common and leaſt eſteemed, in Hungary, Sileſia, Saxony, &c.; the olive and bottle-coloured cat's eye, in Ceylon; the inferior in different countries of Europe. Mr Born mentions what he calls an *avanturine cat's eye*, of a fleſh colour and tranſparent, poſſeſſing the curious ſtructure of the avanturine, viz. compoſed of little plates like ſcales, with a metallic ſplendour, which reflects the rays of light like the opal. This ſtone we ſuſpect to be that which has led authors to claſs the avanturine with the opal, although it is in fact a fine opaque quartz. Ruſſia produces the opal at the rivulet Katſcha, near the city of Kraſnajark, in the Altai mountains in Siberia. The cat's eye is found in Mount Caucaſus, and is often confounded with the opal, though improperly. See Asteria. The oculus mundi (ſee Hydrophanes) has a very intimate connexion with opal, being generally found in beds over it, and being regarded by ſome naturaliſts as the ſame ſtone in a ſtate of decompoſition by the action of the air. Ruſſia poſſeſſes this ſtone in the Altai mountains, where the opals are found.

No method of eſtimating the opal is given by authors that we know of. But thoſe of uncommon beauty and ſize are ſold for very large ſums.

The late Leopald II. emperor of Germany, was in poſſeſſion of an oriental ſtone, ſometimes deſcribed as a cat's eye and ſometimes as an opal, of one inch diameter, and which was valued at a great price. Prince Potemkin, the Ruſſian general, purchaſed for 1000 ducats a ſtone of the ſame kind, ſaid to have been taken by the famous Nadir Shah from the head of a Gentoo idol, of which it made one of the eyes. By what circuitous road it found its way to Potemkin, we have not been informed; but with many other gems it diſappeared from the tent of the Perſian conqueror when he was aſſaſſinated.

Opals are commonly found in detached pieces, in an envelope of a different kind of ſtone, from the ſize of a pin head to that of a walnut. Beautiful opals of this laſt ſize are extremely rare; ſo that it is difficult to find an opal ſufficiently perfect and large to be completely poſſeſſed of all its beauties: this renders it ſo precious, and makes it almoſt impoſſible to determine its value. They have agreed, however, to value a beautiful oriental opal at double the price of a ſapphire of the ſame ſize.

It is very remarkable, that all the beautiful colours of the opal may entirely change or diſappear when the ſtone is divided into pieces. This phenomenon, which has been demonſtrated more than once by experience, leads us to think that all the ſparkling play of the opal is owing to the refraction of the rays of the ſun from the ſurface of the ſtone, which is naturally formed to produce this refraction.

OPALIA, in antiquity, feaſts celebrated at Rome in honour of the goddeſs Ops. Varro ſays they were held on the 19th of December, which was one of the days of the Saturnalia: theſe two feaſts were celebrated in the ſame month, becauſe Saturn and Ops were huſband and wife: the vows offered to the goddeſs were made ſitting on the ground.

OPERA, a dramatic compoſition ſet to muſic, and ſung on the ſtage, accompanied with muſical inſtruments, and enriched with magnificent dreſſes, machines, and other decorations.—This ſpecies of drama is of modern invention. In its preſent ſtate it was not known even in Italy before the beginning of the laſt century; and at its introduction into England, a century afterwards, it divided the wits, literati, and muſicians of the age. By thoſe who were eſteemed the beſt judges of the art, the Engliſh language was conſidered as too rough and inharmonious for the muſic of the opera; and, on the other hand, critics, whoſe taſte was built on the baſis of common ſenſe, looked upon a drama in a foreign and unknown tongue as the greateſt of all abſurdities. Many of them, however, pleaded for operas in the Engliſh language; and it is well known that Addiſon, who was one of the oppoſers of the Italian opera on the London ſtage, wrote in his native tongue the opera of Roſamond. This is confeſſedly a beautiful poem; but, in the opinion of Dr Burney, it adds nothing to Addiſon's fame, as it ſhows his total ignorance of the firſt principles of muſic, and of courſe his unfitneſs for the taſk he had undertaken.

In queſtions reſpecting the fine arts there is no appeal from the general taſte; and therefore, as the French opera, which is in the language of the country where it is acted, has always been admired by perſons of liberal education, it doubtleſs has merit conſidered as a drama; but how the dramas of this kind which are compoſed in Italian ſhould find admirers in England, among perſons who underſtood not a word of the language, is to us a matter of aſtoniſhment. The muſic of them may deſerve and command the admiration of every one who has an ear; and th action of the fingers may be perfectly ſuitable to the ſubject repreſented; but of this ſuitableneſs the majority of the audience can be no judges.

Even when the language is thoroughly underſtood, we ſhould imagine, that, to make an opera agreeable to good ſenſe, much would depend upon the choice of the ſubject; for it is ſurely abſurd to have perſons of all ranks, and on every occaſion, perpetually accompanied with the regular reſponſes of ſymphony. To hear Cæſar, Scipio, or Macbeth, when forming plans to enſure victory, or hatching plots of treaſon and murder, talk[illegible] recitative and keeping time with fiddles, wo[illegible]y diſguſt every perſon whoſe ſenſe had not all evaporated in ſound; but when the ſubject repreſented naturally admits of muſic in real life, we can ſuppoſe an opera to afford to perſons of taſte one of the moſt exquiſite and refined entertainments of which human nature is capable. For a further account of the opera, ſee Music, Nº 39, 42, 44, and Poetry, Nº [illegible], &c.

OPERATION, in general, the act of exerting or exerciſing ſome power or faculty, upon which an effect follows.

Operation, in ſurgery and medicine, denotes a methodical action of the hand on the human body, in order to re-eſtabliſh health.

Plate CCCLI.

OPHIDIUM, a genus of fiſhes belonging to the order of apodes. The principal characters of this genus are the following. The head is ſomewhat naked;

the teeth are in the jaws, palate, and fauces; the body long; the fins of the back, tail, and anus, confounded in one; no fin on the under part of the body; and the eyes covered by the common ſkin. Of this genus there are ſeveral ſpecies, of which the moſt curious is the *ophidium barbatum* of Linnæus, thus deſcribed by Dr Brouſſonet in the 71ſt volume of the Philoſophical Tranſactions.

"The ſcales of the ophidium (ſays he) are irregularly placed and diſperſed over the whole body. Their form is ſometimes round, ſometimes nearly oval. They are larger near the head, and in the lower part of the body; but are hardly to be diſtinguiſhed near the tail. They adhere to the body by means of a particular tranſparent ſkin, which is in general very thin, but ſomewhat thicker near the neck, and extended looſely over the whole head: this *ſkin* is very eaſily deſtroyed, after which the ſcales falling, the body appears ſpotted (fig. 1.) When you look at them with the naked eye (fig. 2.) they appear as covered with very ſmall grains; but viewed through a microſcope (fig. 3.) the middle of them appears more elevated than the margin; and from the centre to the margin, cloſe by each other, there are many lines or rays formed by ſmall ſcales placed upon one another, like tiles upon a roof, the ſuperior being always the nearer to the centre. This ſort of ſcales, which may be called *umbonatæ*, are faſtened to the body by very ſmall veſſels which are inſerted in their middle; they are to be ſeen on the body only, not on the head nor the fins."

The anatomy of this fiſh comprehends ſome very remarkable circumſtances, which, our author thinks, were never obſerved in any other ſpecies. When the ſkin is drawn off, there appears a thin membrane of a ſilver colour, which covers the muſcles. The muſcles being removed, we find the peritoneum, which lines the abdominal cavity, and is adherent to the ſwimming bladder by ſome elongations. It is of a ſilver hue, with ſome very ſmall black points. The ventricle is not to be diſtinguiſhed from the inteſtines by any other mark but by its ſize; its form is oblong; it is extended almoſt to the anus, from whence the inteſtinal duct has a retrograde courſe, and then deſcends again, having a little dilatation near the anus. On the vertebræ next the anus on the outſide of the peritoneum is a kind of cavity of an [illegible] form, containing a reddiſh viſcus, which he ta[illegible]e the kidney.

The firſt vertebra from the head has nothing very remarkable in its ſtructure. The ſecond has on each ſide an elongated and ſharp apophyſis, to the apex of which is annexed a ſmall ligament. The third is very flat, and has on each ſide a kind of triangular and ſharp apophyſis, to which adheres a ligament, as to the ſecond. The fourth is remarkable in having a ſharp apophyſis on each ſide, articulated with the body of the vertebra; and under each of them is another articulated apophyſis, flattiſh, thick, roundiſh at its extremities, and forked at its baſis (fig. 5.) The fifth, which is ſtrongly adherent to the former, has in its middle a bifid proceſs. The ſixth has in its middle a flattiſh elevation, ſharp on each ſide. Between the extremity of the larger apophyſis of the fourth vertebra is a bone, or rather a hard cartilage, which bears the figure of a kidney (fig. 6.) its convexity being turned towards the body of the vertebra: its poſition is parallel to the bodies of the vertebræ; its motion is half circular; one of its parts, *viz.* the loweſt, being in the cavity of the ſwimming bladder, to which it adheres by a thin membrane, ſo that no air can eſcape at that part. It is covered by membranes, which adhere ſtrongly to its middle; in this part are faſtened the two ligaments of the apophyſis of the ſecond and third vertebræ, of which we ſpoke before, and which are of a great tenuity. In the ſame point are faſtened alſo two ligaments, each of which belongs to an oblong muſcle parallel to each other, and fixed to the bones of the loweſt and poſterior part of the head (fig. 4.)

All this apparatus is certainly ſubſervient to the purpoſe of ſwimming; but it is very remarkable, that if theſe parts are neceſſary to ſome animal function, they ſhould not be found in all the individuals; "for I have ſeen (ſays our author) two, of which the vertebræ were not different from the vertebræ of the other ſpecies: which difference depends, perhaps, on the difference of ſex. I am inclined to believe ſo; but the generation in this fiſh ſeems to be no leſs myſterious than that of the eel: I could never diſtinguiſh a male from a female in this ſpecies."

This fiſh commonly grows to the ſize of eight or nine inches. It is to be found in all the Mediterranean ſea, and in great plenty in the Adriatic: its fleſh is not of a good taſte, rather coarſe, as is that of all the ſpecies of fiſhes which, having no ventral fins, are obliged to make great efforts in ſwimming, and have conſequently the muſcles harder.

OPHIOGLOSSUM, ADDER'S TONGUE: A genus of the natural order of filices, belonging to the cryptogamia claſs of plants. The ſpike is articulated, flat, and turned to the two ſides; with the articuli or joints opening acroſs. There are ſeven ſpecies; of which the only remarkable one is the vulgatum, or common adder's tongue, which is a native of ſeveral places of Britain, growing in meadows and moiſt paſtures. The country people make an ointment of the freſh leaves, and uſe it as a vulnerary to green wounds; which is a very ancient application, recommended by Matthiolus, Tragus, and others.

OPHIOMANCY, in antiquity, the art of making predictions from ſerpents. Thus Calchas, on ſeeing a ſerpent devour eight ſparrows with their dam, foretold the duration of the ſiege of Troy: and the ſeven coils of a ſerpent that was ſeen on Anchiſes's tomb, were interpreted to mean the ſeven years that Æneas wandered from place to place before he arrived at Latium.

OPHIORHIZA, in botany: A genus of the monogynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 47th order, *Stellatæ.* The corolla is funnel-ſhaped: the capſule twin, bilocular, and polyſpermous. There are two ſpecies; the moſt remarkable of which is the Aſiaticum, or true lignum colubrinum. The root of this is known in the Eaſt Indies to be a ſpecific againſt the poiſon of the moſt dreadful animal called the *hooded ſerpent.* There is a treatiſe in *Amæn. Acad.* Tom. IV. upon this ſubject, wherein the author Joh. And. Darelius undertakes, from the deſcription of ſuch authors as had ſeen it upon the ſpot, to aſcertain the plant from which the genuine root is taken. It appears in this account, that it had puzzled the European phyſicians; and what had been ſold in the ſhops for it, is the root of a very different plant, and of a poiſonous nature.

The true root is called *mungus*, for the following reaſon.—There is a kind of weaſel in the Eaſt Indies, called *mungutia* by the natives, *mungo* by the Portugueſe, and *muncas* by the Dutch. This animal purſues the hooded ſerpent, as the cat does the mouſe with us. As ſoon as the ſerpent appears, the weaſel attacks him; and if ſhe chances to be bit by him, ſhe immediately runs to find a certain vegetable, upon eating which, ſhe returns, and renews the fight.—The Indians are of opinion that this plant is the mungos.

That celebrated traveller Kæmpfer, who kept one of theſe weaſels tame, that ate with him, lived with him, and was his companion wherever he went, ſays he ſaw one of theſe battles between her and the ſerpent, but could not certainly find out what root the weaſel looked out for. But whether the weaſel firſt diſcovered this antidote or not, it is an infallible remedy againſt the bite of the hooded ſerpent. And this he undertakes to aſcertain.

OPHIOXYLON, in botany: A genus of the monœcia order, belonging to the polygamia claſs of plants; and in the natural method ranking with thoſe of which the order is doubtful. The hermaphrodite calyx is quinquefid; the corolla quinquefid and funnel-ſhaped; with a cylindrical nectarium within its mouth.

Different hypotheſes reſpecting the ſituation of Ophir.

OPHIR, a country mentioned in Scripture, from which Solomon had great quantities of gold brought home in ſhips which he ſent out for that purpoſe; but where to fix its ſituation is the great difficulty, authors running into various opinions on that head. Some have gone to the Weſt, others to the Eaſt Indies, and the eaſtern coaſts of Africa, in ſearch of it.—Mr Bruce the celebrated Abyſſinian traveller has diſplayed much learning and ingenuity in ſettling this queſtion of Biblical hiſtory. To the ſatisfaction of moſt of his readers he has determined Ophir to be Sofala, a kingdom of Africa, on the coaſt of Moſembique, near Zanguebar (ſee SOFALA). His reaſons for this determination are ſo generally known, that it would be improper to repeat them here at length; becauſe ſuch as are not already acquainted with them may conſult his book, which has been long in the hands of the public. He juſtly obſerves, that in order to come to a certainty where this Ophir was, it will be neceſſary to examine what Scripture ſays of it, and to keep preciſely to every thing like deſcription which we can find there, without indulging our fancy farther. 1*ſt*, Then, the trade to Ophir was carried on from the Elanitic gulf through the Indian ocean. 2*dly*, The returns were gold, ſilver, and ivory, but eſpecially ſilver †. 3*dly*, The time of the going and coming of the fleet was preciſely three years ‡, at no period more nor leſs.

2
Hypotheſis of Mr Bruce

Now, if Solomon's fleet ſailed from the Elanitic gulf to the Indian ocean, this voyage of neceſſity muſt have been made by monſoons, for no other winds reign in that ocean. And what certainly ſhows this was the caſe, is the preciſe term of three years in which the fleet went and came between Ophir and Ezion-gaber.

Theſe mines of Ophir were probably what furniſhed the Eaſt with gold in the earlieſt times: great traces of excavation muſt therefore have appeared.

But John dos Santos ſays, that he landed at Sofala in the year 1586; that he ſailed up the great river Cuama as far as Tete, where, always deſirous to be in the neighbourhood of gold, his order had placed their convent. Thence he penetrated for above 200 leagues into the country, and ſaw the gold mines then working at a mountain called *Aſura*. At a conſiderable diſtance from theſe are the ſilver mines of Chicoua; at both places there is a great appearance of ancient excavations; and at both places the houſes of the kings are built with mud and ſtraw, whilſt there are large remains of maſſy buildings of ſtone and lime.

Arguments in ſupport of it.

Every thing then conſpires to fix the Ophir of Solomon in the kingdom of Sofala, provided it would neceſſarily require neither more nor leſs than three years to make a voyage from Ezion-gaber to that place and Tarſhiſh and return. To eſtabliſh this important fact, our author obſerves, that the fleet or ſhip for Sofala, parting in June from Ezion-gaber (ſee EZION-GABER), would run down before the northern monſoon to Mocha (ſee MOCHA). Here, not the monſoon, but the direction of the gulf, changes; and the violence of the ſouth-weſters, which then reign in the Indian ocean, make themſelves at times felt even in Mocha roads. The veſſel therefore comes to an anchor in the harbour of Mocha; and here ſhe waits for moderate weather and a fair wind, which carries her out of the ſtraits of Babelmandel, through the few leagues where the wind is variable.

Her courſe from this is nearly ſouth-weſt, and ſhe meets at Cape Gardefan a ſtrong ſouth-weſter that blows directly in her teeth. Being obliged to return into the gulf, ſhe miſtakes this for a trade-wind; becauſe ſhe is not able to make her voyage to Mocha but by the ſummer monſoon, which carries her no farther than the ſtraits of Babelmandel, and then leaves her in the face of a contrary wind, a ſtrong current to the northward, and violent ſwell.

The attempting this voyage with ſails, in theſe circumſtances, was abſolutely impoſſible, as their veſſels went only before the wind: if it was performed at all, it muſt have been by oars; and great havock and loſs of men muſt have been the conſequence of the ſeveral trials.

At laſt, philoſop[illegible] obſervation, together with the unwearied perſeverance of man bent upon his own views and intereſt, removed theſe difficulties, and ſhowed the mariners of the Arabian gulf, that theſe periodical winds, which in the beginning they looked upon as invincible barriers to the trading to Sofala, when once underſtood, were the very means of performing this voy[illegible]ly and expeditiouſly.

The veſſel tra[illegible] to Sofala ſailed from the bottom of the Arabian gulf in ſummer, with the monſoon at north, which carried her to Mocha. There the monſoon failed her by the change of the direction of the gulf. The ſouth-weſt winds, which blow without Cape Gardefan in the Indian ocean, forced themſelves round the cape ſo as to be felt in the road of Mocha, and make it uneaſy riding there. But thoſe ſoon changed, the weather became moderate, and the veſſel, we ſuppoſe in the month of Auguſt, was ſafe at anchor under Cape Gardefan, where was the port which, many years afterwards, was called *Promontorium Aromatum*. Here the ſhip was obliged to ſtay all November, becauſe all theſe ſummer months the wind ſouth of the cape was a ſtrong ſouth-weſter, as hath been before ſaid, directly in the teeth of the voyage to Sofala. But this time was not laſt; part of the goods bought to be ready for the return was ivory, frankincenſe, and myrrh; and the ſhip was then at the principal mart for theſe.

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† 1 Kings x. 22.

‡ 1 Kings, x. 22. 2 Chron. ix. 21.

Our author ſuppoſes, that in November the veſſel ſailed with the wind at north-eaſt, with which ſhe would ſoon have made her voyage: but off the coaſt of Melinda, in the beginning of December, ſhe there met an anomalous monſoon at ſouth-weſt, in our days firſt obſerved by Dr Halley, which cut off her voyage to Sofala, and obliged her to put into the ſmall harbour of Mocha, near Melinda, but nearer ſtill to Tarſhiſh, which we find here by accident, and which we think a ſtrong corroboration that we are right as to the reſt of the voyage. In the annals of Abyſſinia, it is ſaid that Amda Sion, making war upon that coaſt in the 14th century, in a liſt of the rebellious Mooriſh vaſſals, mentions the chief of Tarſhiſh as one of them, in the very ſituation where we have now placed him.

Solomon's veſſel, then, was obliged to ſtay at Tarſhiſh till the month of April of the ſecond year. In May, the wind ſet in at north-eaſt, and probably carried her that ſame month to Sofala. All the time ſhe ſpent at Tarſhiſh was not loſt, for part of her cargo was to be brought from that place; and ſhe probably bought, beſpoke, or left it there. From May of the ſecond year, to the end of that monſoon in October the veſſel could not ſtir; the wind was north-eaſt. But this time, far from being loſt, was neceſſary to the traders for getting in their cargo, which we ſhall ſuppoſe was ready for them.

The ſhip ſails on her return, in the month of November of the ſecond year, with the monſoon ſouth-weſt, which in a very few weeks would have carried her into the Arabian gulf. But off Moccha, near Melinda and Tarſhiſh, ſhe met the north-eaſt monſoon, and was obliged to go into that port and ſtay there till the end of that monſoon; after which a ſouth-weſter came to her relief in May of the third year. With the May monſoon ſhe ran to Mocha within the ſtraits, and was there confined by the ſummer monſoon blowing up the Arabian gulf from Suez, and meeting her. Here ſhe lay till that monſoon which in ſummer blows northerly from Suez, changed to a ſouth-eaſt one in October or November, and that very eaſily brought her up into the Elanitic gulf, the middle or end of December of the third year. She had no need of more time to complete her voyage, and it was not poſſible ſhe could do it in leſs.

Such is a very ſhort and imperfect abſtract of our author's reaſons for placing Ophir in Sofala. If it excite the curioſity of our readers to conſult his work, it will anſwer the purpoſe for which we have made it.

4 Another hypotheſis.

We are now to give another ingenious conjecture concerning the ſituation of Ophir and Tarſhiſh, with which we have been favoured by Dr Doig, the learned author of Letters on the Savage State addreſſed to Lord Kames.

This reſpectable writer holds that Ophir was ſomewhere on the weſt coaſt of Africa, and that Tarſhiſh was the ancient Bætica in Spain. His eſſay is not yet publiſhed; but he authorizes us to give the following abſtract of it: "The firſt time that *Ophir*, or rather *Aufir*, occurs in Scripture, is in Gen. x. 29. where the ſacred hiſtorian, enumerating the ſons of Joktan, mentions Aufir as one of them." According to his account, the deſcendants of thoſe 13 brothers ſettled all in a contiguous ſituation, from Meſha (the Mocha of the moderns) to Sepharah, a mountain of the eaſt. Moſes, as every one knows, denominates countries, and the inhabitants of countries, from the patriarch of whom thoſe inhabitants deſcended. In deſcribing the courſe of one of the branches of the river of paradiſe, the ſame Moſes informs us that it encompaſſed the whole land of Havilah, &c. which abounded with fine gold, bdellium, and the onyx ſtone; and this land had its name from Havilah the 12th ſon of the patriarch Jotkan. *Ophir* or *Aufir* was Havilah's immediate elder brother; and of courſe the deſcendants of the former, in all probability, fixed their habitation in the neighbourhood of thoſe of the latter. If, then, the land of Havilah abounded with gold and precious ſtones, the land of Ophir undoubtedly produced the very ſame articles.

5 The original Ophir not the Ophir of Solomon; of which

Here then we have the original Ophir; here was found the primary gold of Ophir; and here lay the Ophir mentioned in Job xi. 24. But as navigation was then in its infant ſtate, the native land of gold mentioned by Job muſt have been much nearer home than that to which the fleets of Solomon and Hiram made their triennial voyages. That ſeveral countries on the ſouth-eaſt coaſt of Africa abounded with gold long after the era of Job, is evident from the teſtimony of Herodotus, Strabo, Diodorus Siculus, Ptolemy, Pomponius Mela, &c.; but that in theſe countries the Ophir of Solomon could not be ſituated, is plain, becauſe his ſhips in the ſame voyage touched at Tarſhiſh, which lay in a very different quarter.

The Abyſſinian traveller has placed this *regio aurifera* in Sofala on the eaſtern coaſt of Africa, nearly oppoſite to the iſland of Madagaſcar. This hypotheſis was current a hundred years before he was born; but I am perſuaded (ſays our author) that it is not tenable. The Ophir of Solomon, in whatever part of Africa it lay, muſt have been well known, prior to his reign, both to the Phœnicians and the Edomites. Theſe people navigated that monarch's fleet, and therefore could be no ſtrangers to the port whither they were bound. That it was in Africa is certain; and that it was on the weſt coaſt of that immenſe peninſula, will appear more than probable, when we have aſcertained the ſituation of Tarſhiſh, and the uſual courſe of Phœnician navigation. To theſe objects, therefore, we ſhall now direct our inquiries.

6 Th ſituation muſt be aſcerta by di th Tarſhiſh.

"Javan, the fourth ſon of the patriarch Japhet, had four ſons, Eliſha, *Tarſhiſh*, Kittim, and Dodanim or Rodanim; among whoſe 'deſcendants were the iſles of the Gentiles divided.' The city of *Tarſus* on the coaſt of Cilicia, at once aſcertains the region colonized by the deſcendants of Tarſhiſh. But as much depends upon determining the poſition of this country, I ſhall endeavour (ſays the Doctor) to fix it with all poſſible preciſion.

"In the firſt place, I muſt beg leave to obſerve, that there is not a ſingle paſſage in any ancient author, ſacred or profane, that ſo much as alludes to any city, diſtrict, canton, or country, of the name of Tarſhiſh in the eaſtern parts of the world. The deſcendants of Javan, of whom Tarſhiſh was one, are agreed on all hands to have extended their ſettlements towards the north-weſt, i. e. into Aſia Minor, Italy, and Spain. The inhabitants of Tarſhiſh are everywhere in Scripture ſaid to be addicted to navigation and commerce, in which they ſeem to have been connected with the Tyrians and Phœnicians, †, who were always ſaid by the Jews to inhabit the iſles of the ſea. Indeed, in Hebrew geography, all the countries toward the north and weſt, which were divided from Judea by the ſea, were called the iſles of the ſea ‡. Thus Iſaiah: 'The burden of Tyre. Howl ye ſhips of Tarſhiſh, for it is laid waſte, ſo that there is no houſe, no entering in: from the land of Chittim it is revealed unto them. Be ſtill ye inhabitants of the iſle, thou whom the merchants of Zidon, that paſs over the ſea, have repleniſhed.' The land of Chittim was Macedonia, and often Greece, from which every one knows that the deſtruction of Tyre came; and that Tarſhiſh was not an unconcerned ſpectator of that deſtruction, is obvious from the ſame prophet, who proceeds to ſay ||. 'As at the report concerning Egypt, ſo ſhall they be ſorely pierced at the report concerning Tyre. Paſs over to Tarſhiſh; howl ye inhabitants of the iſle. Is this your joyous city? It appears likewiſe from Ezekiel *, that Tarſhiſh was the merchant with whom Tyre traded for ſilver, iron, tin, and lead, and that this trade was carried on in fairs.

† Pſ. xlviii. 7. lxxii. 10.

‡ Gen. ii. 26.

|| Iſ. xxiii. *paſſim.*

The original Tarſhiſh where ſituated.

"From all theſe paſſages, it ſeems to be evident, that the deſcendants of Tarſhiſh ſettled on the weſtern coaſt of Aſia Minor; that theſe people were addicted to navigation and commerce; that in the courſe of their traffic they were connected with the Tyrians and Phœnicians; that the commerce they carried on conſiſted of ſilver, iron, tin, and lead; that the people of Tarſhiſh were connected with Kittim and the iſles of the Gentiles, which are confeſſedly ſituated toward the north and weſt of Judea.

"But leaſt, after all, a fact ſo fully authenticated ſhould ſtill be called in queſtion, I ſhall add one proof more, which will place the matter beyond the reach of doubt and controverſy.

"When the prophet Jonah intended to flee from the preſence of the Lord, in order to avoid preaching at Nineveh, let us ſee where the peeviſh deſerter embarked. (Jonah i. 3.) "And Jonah roſe up to flee unto Tarſhiſh, from the preſence of the Lord, and went down to Joppa; and he found a ſhip going to Tarſhiſh, and he paid the fare thereof, and went down into it, to go with them into Tarſhiſh, from the preſence of the Lord.' Every body knows that Joppa or Japhah ſtood upon the ſhore of the Mediterranean; of courſe the fugitive prophet had determined to go to ſome very diſtant region weſtward, and by that means to get as far from Nineveh as poſſible."

This not the Tarſhiſh of Solomon.

Having thus proved to a demonſtration, that the original Tarſhiſh was a region on the weſtern coaſt of Aſia Minor, where either the patriarch of that name, or ſome of his immediate deſcendants, planted a colony, it remains to determine whether this was actually the country from which Solomon imported the vaſt quantities of ſilver mentioned by the ſacred hiſtorian. That it was not, our author frankly acknowledges; and therefore, ſays he, we muſt look out for Solomon's Tarſhiſh in ſome other quarter of the globe.

To pave the way for this diſcovery, he very juſtly obſerves, that it has at all times been a common practice to transfer the name of one country to another, in conſequence of ſome analogy or reſemblance between them. It has likewiſe often happened, that when a commodity was brought from a very diſtant country by a very diſtant people, the people to whom it was imported have taken it for granted that it was produced in the region from which it was immediately brought to them. Of the truth of this poſition no man acquainted with the Greek and Roman poets can for a moment entertain a doubt. Hence the *Aſſyrium amomum* of Virgil, and the *Aſſyrium malabathrum* of Horace, though theſe articles were the product not of Aſſyria but of India. The Jews, who were as little acquainted with foreign countries as the Greeks and Romans, had very probably the ſame notions with them reſpecting articles of commerce; and if ſo, they would undoubtedly ſuppoſe, that the ſilver ſold by the merchants of Tarſhiſh was the product of that country. When this miſtake came to be diſcovered, they very naturally transferred the name *Tarſhiſh* from the country of the merchants to that of the articles which they imported. Let us now, ſays our author, try if we cannot find out where that country was.

9 The name of one country transferred to another.

It has been already ſhown, by quotations from Iſaiah and Ezekiel, that the merchants of Tarſhiſh traded in the markets of Tyre with ſilver, iron, lead, and tin. To theſe authorities, we ſhall add another from Jeremiah: "Silver (ſays that prophet) ſpread into plates is brought from Tarſhiſh." "But in Spain (continues our learned diſſertator), all thoſe commodities were found in the greateſt abundance. All the ancient authors who deſcribe that region dwell with rapture on its ſilver mines. This fact is too generally known to need to be ſupported by authorities. Spain was then the region which furniſhed Solomon's traders with the immenſe maſs of ſilver he is ſaid to have imported. This was, one might ſay, the modern Tarſhiſh; and hence both Joſephus and Euſebius are poſitive that the poſterity of Tarſhiſh actually peopled that country. If this was an early opinion, as it certainly was, the Jews would of courſe denominate Spain from the patriarch in queſtion.

"I have ſhown above, that the inhabitants of Tarſhiſh were ſtrictly connected with the Kittim, or Grecians: I ſhall here produce an authority which will prove to a demonſtration that the Kittim had extended their commerce into that part of Africa now called Barbary.

"The prophet Ezekiel, (xxvii. 6.) deſcribing the ſplendour and magnificence of Tyre, tells us, 'that the company of the Aſhurites made her benches of ivory, brought from the iſles of Kittim.' In the firſt place, I muſt obſerve, that there is probably a ſmall error in the orthography of the word Aſhurim. This term is everywhere in Scripture tranſlated Aſſyrians, entertained any doubt concerning the ſame property in flint glaſs, the effect of which is three times as great as crown glaſs. One may obſerve, however, in theſe kinds of glaſs, ſomething of a proportion between the mean refraction and the diſperſion of rays, which may enable us to reconcile theſe ſurpriſing effects with other principles already known.

Here, however, M. Euler announces to us another diſcovery of the ſame M. Zeiher, no leſs ſurpriſing than the former, and which diſconcerted all his ſchemes for reconciling the above-mentioned phenomena. As the ſix kinds of glaſs mentioned in the above table were compoſed of nothing but minium and flint, M. Zeiher happened to think of mixing alkaline ſalts with them, in order to give the glaſs a conſiſtence more proper for dioptric uſes; when he was much ſurpriſed to find this mixture greatly diminiſhed the mean refraction, almoſt without making any change in the diſperſion. After many trials, he at length obtained a kind of glaſs greatly ſuperior to the flint glaſs of Mr Dollond, with reſpect to the conſtruction of teleſcopes; ſince it occaſioned three times as great a diſperſion of the rays as the common glaſs, at the ſame time that the mean refraction was only as 1.61 to 1.

M. Euler alſo gives particular inſtructions how to find both the mean and extreme refractive power of different kinds of glaſs; and particularly adviſes to make uſe of priſms with very large refracting angles, not leſs than 70°.

Notwithſtanding it evidently appeared, we may ſay, to almoſt all philoſophers, that Mr Dollond had made a real diſcovery of ſomething not comprehended in the optical principles of Sir Iſaac Newton, it did not appear ſo to Mr Murdoch. Upon this occaſion, he interpoſed in the defence, as he imagined, of Sir Iſaac Newton; maintaining, that Mr Dollond's poſitions, which, he ſays, he knows not by what miſhap have been deemed paradoxes in Sir Iſaac's theory of light, are really the neceſſary conſequences of it. He alſo endeavours to ſhow that Sir Iſaac might not be miſtaken in his account of the experiment above mentioned. But, admitting all that he advances in this part of his defence, Newton muſt have made uſe of a priſm with a much ſmaller refracting angle than, from his own account of his experiments, we have any reaſon to believe that he ever did make uſe of.

The fact probably was, that Sir Iſaac deceived himſelf in this caſe, by attending to what he imagined to be the clear conſequence of his other experiments; and though the light he ſaw was certainly tinged with colours, and he muſt have ſeen it to be ſo, yet he might imagine that this circumſtance aroſe from ſome imperfection in his priſms, or in the diſpoſition of them, which he did not think it worth his while to examine. It is alſo obſervable, that Sir Iſaac is not ſo particular in his deſcription of his priſms, and other parts of his apparatus, in his account of his experiment, as he generally is in other caſes; and therefore, probably, wrote his account of it from his memory only. In reality, it is no reflection upon Sir Iſaac Newton, who did ſo much, to ſay that he was miſtaken in this particular caſe, and that he did not make the diſcovery that Mr Dollond did; though it be great praiſe to Mr Dollond, and all thoſe perſons who contributed to this diſcovery, that they ventured to call in queſtion the authority of ſo great a man.

Mr Dollond, however, was not the only optician who had the merit of making this diſcovery; it had been made and applied to the ſame purpoſe by a private gentleman—Mr Cheſt of Cheſt hall. He had obſerved that priſms of flint glaſs gave larger ſpectrums than priſms of water when the mean refraction was the ſame in both, i. e. when the deviation of the refracted ray from the direction of the incident was the ſame. He tried priſms of other glaſs, and found ſimilar differences; and he employed the diſcovery in the ſame manner, and made achromatic experiments ſome time before Dollond. Theſe facts came out in a proceſs raiſed at the inſtance of Watkins optician at Charing-croſs, as alſo in a publication by Mr Ramſden optician. There is, however, no evidence that Dollond ſtole the idea from Mr Cheſt, or that they had not both claims to the diſcovery.

19
Diſcovery of Dr Robert Blair for this purpoſe.

Still the beſt refracting teleſcopes, conſtructed on the principles of Mr Dollond, are defective, on account of that colour which, by the aberration of the rays, they give to objects viewed through them, unleſs the object glaſs be of ſmall diameter. This defect men of genius and ſcience have laboured to remove, ſome by one contrivance and ſome by another. Father Boſcowich, to whom every branch of optics is much indebted, has, in his attempts for this purpoſe, diſplayed much ingenuity; but the philoſopher whoſe exertions have been crowned with moſt ſucceſs, and who has perhaps made the moſt important diſcovery in this branch of ſcience ſince the era of Newton, is Dr Robert Blair regius profeſſor of aſtronomy in the college of Edinburgh. By a judicious ſet of experiments ably conducted, he has proved, that the quality of diſperſing the rays in a greater degree than crown glaſs, is not confined to a few mediums, but is poſſeſſed by a great variety of fluids, and by ſome of theſe in a moſt extraordinary degree. He has ſhown, that although the greater refrangibility of the violet rays than of the red rays, when light paſſes from any medium whatever into a vacuum, may be conſidered as a law of nature; yet in the paſſages of light from one medium into another, it depends entirely on the qualities of the mediums which of theſe rays ſhall be the moſt refrangible, or whether there ſhall be any difference in their refrangibility. In order to correct the aberration ariſing from difference of refrangibility among the rays of light, he inſtituted a ſet of experiments, in the conducting of which he detected a very ſingular and important quality in the muriatic acid. In all the diſperſive mediums hitherto examined, the green rays, which are the mean refrangible in crown glaſs, were found among the leſs refrangible; but in the muriatic acid, theſe ſame rays were by him found to make a part of the more refrangible. This diſcovery led to complete ſucceſs in removing the great defect of optical inſtruments, viz that diſſipation or aberration of the rays which ariſe from their unequal refrangibility, and has hitherto rendered it impoſſible to converge all of them to one point either by ſingle or oppoſite refractions. A fluid, in which the particles of marine acid and metalline particles hold a due proportion, at the ſame time that it ſeparates the extreme rays of the ſpectrum much more than crown glaſs, refracts all the orders of the rays in the ſame proportion that glaſs does: and hence rays of all colours made to diverge by the refraction of the glaſs, may either be rendered parallel by a ſubſequent refraction made in the confine of the glaſs and this fluid; or, by weakening the refractive denſity of the fluid, the refraction which takes place in the confine of it and glaſs may be rendered as regular as reflexion, without the leaſt colour whatever. The Doctor has a teleſcope, not exceeding 15 inches in length, with a compound object glaſs of this kind, which equals in all reſpects, if it does not ſurpaſs, the beſt of Dollond's 42 inches long. Of this object glaſs a figure will be found in the third volume of the Tranſactions of the Royal Society of Edinburgh; and to that volume we muſt refer our readers for a full and perſpicuous account of the experiments which led to this diſcovery, as well as of the important purpoſes to which it may be applied.

20 Of the refraction of the atmoſphere.

We ſhall conclude the hiſtory of the diſcoveries concerning refraction, with ſome account of the refractions of the atmoſphere.—Tables of this have been calculated by Mr Lambert, with a view to correct the inaccuracies of geometrical obſervations of the altitudes of mountains. The obſervations of Mr Lambert, however, go upon the ſuppoſition that the refractive power of the atmoſphere is invariable: But this is by no means the caſe; and therefore his rules muſt be conſidered as true for the mean ſtate of the air only.

A moſt remarkable variety in the refractive power of the atmoſphere was obſerved by Dr Nettleton, near Halifax in Yorkſhire, which demonſtrates how little we can depend upon the calculated heights of mountains, when the obſervations are made with an inſtrument, and the refractive power of the air is to be allowed for. Being deſirous to learn, by obſervation, how far the mercury would deſcend in the barometer at any given elevation (for which there is the beſt opportunity in that hilly country), he propoſed to take the height of ſome of their higheſt hills; but when he attempted it, he found his obſervation ſo much diſturbed by refraction, that he could come to no certainty. Having meaſured one hill of a conſiderable height, in a clear day, and obſerved the mercury at the bottom and at the top, he found, according to that eſtimation, that about 90 feet or more were required to make the mercury fall $\frac{1}{10}$th of an inch; but afterwards, repeating the experiment on a cloudy day, when the air was rather groſs and hazy, he found the ſmall angles ſo much increaſed by refraction as to make the hill much higher than before. He afterwards frequently made obſervations at his own houſe, by pointing a quadrant to the tops of ſome neighbouring hills, and obſerved that they would appear higher in the morning before ſunriſe, and alſo late in the evening, than at noon in a clear day, by ſeveral minutes. In one caſe the elevations of the ſame hill differed more than 30 minutes. From this he infers, that obſervations made on very high hills, eſpecialy when viewed at a diſtance, and under ſmall angles, as they generally are, are probably uncertain, and not much to be depended upon.

M. Euler conſidered with great accuracy the refractive power of the atmoſphere, as affected by different degrees of heat and elaſticity; in which he ſhows, that its refractive power, to a conſiderable diſtance from the zenith, is ſufficiently near the proportion of the tangent of that diſtance, and that the law of refraction follows the direct ratio of the height of the barometer, and the inverſe ratio of the difference marked by the thermometer; but when ſtars are in the horizon, the changes are in a ratio ſomewhat greater than this, more eſpecially on account of the variation in the heat.

21 Mr Michell's opinion concerning the twinkling of the ſtars.

The cauſe of the twinkling of the ſtars is now generally acknowledged to be the unequal refraction of light, in conſequence of inequalities and undulations in the atmoſphere.

Mr Michell ſuppoſes that the arrival of fewer or more rays at one time, eſpecially from the ſmaller or the more remote fixed ſtars, may make ſuch an unequal impreſſion upon the eye, as may, at leaſt, have ſome ſhare in producing this effect; ſince it may be ſuppoſed, that even a ſingle particle of light is ſufficient to make a ſenſible impreſſion upon the organs of ſight; ſo that very few particles arriving at the eye in a ſecond of time, perhaps no more than three or four, may be ſufficient to make an object conſtantly viſible. For though the impreſſion may be conſidered as momentary, yet the perception occaſioned by it is of ſome duration. Hence, he ſays, it is not improbable that the number of the particles of light which enter the eye in a ſecond of time, even from Sirius himſelf (the light of which does not exceed that of the ſmalleſt viſible fixed ſtar, in a greater proportion than that of about 1000 to 1), may not exceed 3000 or 4000, and from ſtars of the ſecond magnitude they may, therefore, probably not exceed 100. Now the apparent increaſe and diminution of the light which we obſerve in the twinkling of the ſtars, ſeems to be repeated at not very unequal intervals, perhaps about four or five times in a ſecond. He therefore thought it reaſonable to ſuppoſe, that the inequalities which will naturally ariſe from the chance of the rays coming ſometimes a little denſer, and ſometimes a little rarer, in ſo ſmall a number of them as muſt fall upon the eye in the fourth or fifth part of a ſecond, may be ſufficient to account for this appearance. An addition of two or three particles of light, or perhaps a ſingle one, upon 20, eſpecially if there ſhould be an equal deficiency out of the next 20, would, he ſuppoſed, be very ſenſible, as he thought was probable from the very great difference in the appearance of ſtars, the light of which does not differ ſo much as is commonly imagined. The light of the middlemoſt ſtar in the tail of the Great Bear does not, he thinks, exceed the light of the very ſmall ſtar that is next to it in a greater proportion than that of about 16 or 20 to 1; and M. Bouguer found, that a difference in the light of objects of one part in 66 was ſufficiently diſtinguiſhable.

It will perhaps, he ſays, be objected, that the rays coming from Sirius are too numerous to admit of a ſufficient inequality ariſing from the common effect of chance ſo frequently as would be neceſſary to produce this effect, whatever might happen with reſpect to the ſmaller ſtars; but he obſerves, that, till we know what inequality is neceſſary to produce this effect, we can only gueſs at it one way or the other.

Since theſe obſervations were publiſhed, Mr Michell has entertained ſome ſuſpicion that the unequal denſity of light does not contribute to this effect in ſo great degree as he had imagined, eſpecially in conſequence of obſerving that even Venus does ſometimes twinkle. This he once obſerved her to do remarkably when was ſhe about 6 degrees high, though Jupiter, which was then about 16 degrees high, and was ſenſibly leſs luminous, did not twinkle at all. If, notwithſtanding the great number of rays which, no doubt, come to the eye from ſuch a ſurface as this planet preſents, its appearance be liable to be affected in this manner, it muſt be owing to ſuch undulations in the atmoſphere, as will probably render the effect of every other cauſe altogether inſenſible. The conjecture, however, has ſo much probability in it, that it well deſerved to be recited.

22 M. Muſchenbroek's opinion.

M. Muſchenbroek ſuſpects, that the twinkling of the ſtars ariſes from ſome affection of the eye, as well as the ſtate of the atmoſphere. For he ſays, that in Holland, when the weather is froſty, and the ſky very clear, the ſtars twinkle moſt manifeſtly to the naked eye, though not in teleſcopes; and ſince he does not ſuppoſe that there is any great exhalation, or dancing of the vapour at that time, he queſtions whether the vivacity of the light affecting the eye may not be concerned in the phenomenon.

But this philoſopher might very eaſily have ſatisfied himſelf with reſpect to this hypotheſis, by looking at the ſtars near the zenith, when the light traverſes but a ſmall part of the atmoſphere, and therefore might be expected to affect the eye the moſt ſenſibly. For he would not have perceived them to twinkle near ſo much, as they do near the horizon, when much more of their light is intercepted by the atmoſphere.

Some aſtronomers have lately endeavoured to explain the twinkling of the fixed ſtars by the extreme minuteneſs of their apparent diameter; ſo that they ſuppoſe the ſight of them is intercepted by every mote that floats in the air. But Mr Michell obſerves, that no object can hide a ſtar from us that is not large enough to exceed the apparent diameter of the ſtar, by the diameter of the pupil of the eye; ſo that if a ſtar was a mathematical point, the interpoſing object muſt ſtill be equal in ſize to the pupil of the eye: nay, it muſt be large enough to hide the ſtar from both eyes at the ſame time.

Beſides a variation in the quantity of light, a momentary change of colour has likewiſe been obſerved in ſome of the fixed ſtars. Mr Melville ſays, that when one looks ſtedfaſtly at Sirius, or any bright ſtar not much elevated above the horizon, its colour ſeems not to be conſtantly white, but appears tinctured, at every twinkling, with red and blue. This obſervation Mr Melville puts among his queries, with reſpect to which he could not entirely ſatisfy himſelf; and he obſerves, that the ſeparation of the colours by the refractive power of the atmoſphere is, probably, too ſmall to be perceived. But the ſuppoſition of Mr Michell above-mentioned will pretty well account for this circumſtance, though it may be thought inadequate to the former caſe. For the red and blue rays being much fewer than thoſe of the intermediate colours, and therefore much more liable to inequalities, from the common effect of chance, a ſmall exceſs or defect in either of them will make a very ſenſible difference in the colour of the ſtars.

§ 3. *Diſcoveries concerning the Reflection of Light*

23 Account of the diſcoveries of the ancients.

However much the ancients might have been miſtaken with regard to the nature of light, we find that they were acquainted with two very important obſervations concerning it; viz. that light is propagated in right lines, and that the angle of incidence is equal to the angle of reflection. Who it was that firſt made theſe important obſervations is not known. But indeed, important as they are, and the foundation of a great part of even the preſent ſyſtem of optics, it is poſſible that, if he were known, he might not be allowed to have any ſhare of merit, at leaſt for the *former* of them; the fact is ſo very obvious, and ſo eaſily aſcertained. As to the latter, that *the angle of incidence is equal to the angle of reflection*, it was probably firſt diſcovered by obſerving a ray of the ſun reflected from the ſurface of water, or ſome other poliſhed body; or from obſerving the images of objects reflected by ſuch ſurfaces. If philoſophers attended to this phenomenon at all, they could not but take notice, that, if the ray fell nearly perpendicular upon ſuch a ſurface, it was reflected near the perpendicular; and if it fell obliquely, it was reflected obliquely: and if they thought applying any kind of meaſures to theſe angles, however coarſe and imperfect, they could not but ſee that there was ſufficient reaſon to aſſert their equality. At the ſame time they could not but know that the incident and reflected rays were both in the ſame plane.

Ariſtotle was ſenſible that it is the reflection of light from the atmoſphere which prevents total darkneſs after the ſun ſets, and in places where he doth not ſhine in the day time. He was alſo of opinion, that rainbows, halos, and mock ſuns, were all occaſioned by the reflection of the ſun beams in different circumſtances by which an imperfect image of his body was produced, the colour only being exhibited, and not his proper figure. The image, he ſays, is not ſingle, as in a mirror; for each drop of rain is too ſmall to reflect a viſible image, but the conjunction of all the images is viſible.

24 Euclid's treatiſe of optics.

Without inquiring any farther into the nature of light or viſion, the ancient geometricians contented themſelves with deducing a ſyſtem of optics from the two obſervations mentioned above, viz. the rectilinear progreſs of light, and the equality of the angles of incidence and reflection. The treatiſe of optics which has been aſcribed to Euclid is employed about determining the apparent ſize and figure of objects, from the angle under which they appear, or which the extremities of them ſubtend at the eye, and the apparent place of the image of an object reflected from a poliſhed miror; which he fixes at the place where the reflected ray meets a perpendicular to the miror drawn through the object. But this work is ſo imperfect, and ſo inaccurately drawn up, that it is not generally thought to be the production of that great geometrician.

25 Of the burning glaſſes of the ancients.

It appears from a circumſtance in the hiſtory of Socrates, that the effects of burning glaſſes had alſo been obſerved by the ancients; and it is probable that the Romans had a method of lighting their ſacred fire by means of a concave ſpeculum. It ſeems indeed to have been known pretty early, that there is an increaſe of heat in the place where the rays of light meet, when they are reflected from a concave mirror. The burning power of concave mirrors is taken notice of by Euclid in the ſecond book of the treatiſe abovementioned. If we give but a ſmall degree of credit to what ſome ancient hiſtorians are ſaid to have written concerning the exploits of Archimedes, we ſhall be induced to think that he made great uſe of this principle, in conſtructing ſome very powerful burning mirrors: but nothing being ſaid of other perſons making uſe of his inventions, the whole account is very doubtful. It is allowed, however, that this eminent geometrician did write a treatiſe on the ſubject of burning mirrors, though it be not now extant.

Plate CCCLII.

B. Porta ſuppoſes that the burning mirrors of the ancients were of metal, in the form of a ſection of a parabola. It follows from the properties of this curve, that all the rays which fall upon it, parallel to its axis, will meet in the ſame point at the focus. Conſequently, if the vertex of the parabola be cut off, as in fig. 1. it will make a convenient burning mirror. In ſome drawings of this inſtrument the fruſtum is ſo ſmall, as to look like a ring. With an inſtrument of this kind, it is thought, that the Romans lighted their ſacred fire. Some have alſo thought that this was the form of the mirror with which Archimedes burnt the Roman fleet; uſing either a lens, to throw the rays parallel, when they had been brought to a focus; or applying a ſmaller parabolic mirror for this purpoſe, as is repreſented fig. 2. But Dechales ſhows, that it is impoſſible to convey any rays in a direction parallel to one another, except thoſe that come from the ſame point in the ſun's diſk.

26 Of ſeeing images in the air.

All this time, however, the nature of reflection was very far from being underſtood. Even Lord Bacon, who made much greater advances in natural philoſophy than his predeceſſors, and who pointed out the true method of improving it, was ſo far deceived with regard to the nature of reflection and refraction, that he ſuppoſed it poſſible to ſee the image reflected from a looking glaſs, without ſeeing the glaſs itſelf; and to this purpoſe he quotes a ſtory of Friar Bacon, who is reported to have apparently walked in the air between two ſteeples, and which was thought to have been effected by reflection from glaſſes while he walked upon the ground.

The whole buſineſs of ſeeing images in the air may be traced up to Vitellio; and what he ſaid upon the ſubject ſeems to have paſſed from writer to writer, with conſiderable additions, to the time of Lord Bacon. What Vitellio endeavours to ſhow is, that it is poſſible, by means of a cylindrical convex ſpeculum, to ſee the images of objects in the air, out of the ſpeculum, when the objects themſelves cannot be ſeen. But, if his deſcription of the apparatus requiſite for this experiment be attended to, it will be ſeen that the eye was to be directed towards the ſpeculum, which was placed within a room, while both the object and the ſpectator were without it. But though he recommends this obſervation to the diligent ſtudy of his readers, he has not deſcribed it in ſuch a manner as is very intelligible; and, indeed, it is certain, that no ſuch effect can be produced by a convex mirror. If he himſelf did make any trial with the apparatus that he deſcribes for this purpoſe, he muſt have been under ſome deception with reſpect to it.

B. Porta ſays, that this effect may be produced by a plane mirror only; and that an ingenious perſon may ſucceed in it: but his more particular deſcription of a method to produce this extraordinary appearance is by a plane mirror and a concave one combined.

Kircher alſo ſpeaks of the poſſibility of exhibiting theſe pendulous images, and ſuppoſes that they are reflected from the denſe air: and the moſt perfect and pleaſing deception depending upon the images in the air is one of which this writer gives a particular account in his *Ars Magna Lucis et Umbræ*, p. 783. In this caſe the image is placed at the bottom of a hollow poliſhed cylinder, by which means it appears like a real ſolid ſubſtance, ſuſpended within the mouth of the veſſel. In this manner, he ſays, he once exhibited a repreſentation of the aſcenſion of Chriſt; when the images were ſo perfect, that the ſpectators could not be perſuaded, but by attempting to handle them, that they were not real ſubſtances.

Among other amuſing things that were either invented or improved by Kircher, was the method of throwing the appearance of letters, and other forms of things, into a darkened room from without, by means of a lens and a plane mirror. The figures or letters were written upon the face of the mirror, and inverted, and the focus of the lens was contrived to fall upon the ſcreen or wall that received their images. In this manner, he ſays, that with the light of the ſun he could throw a plain and diſtinct image 500 feet.

27 Diſcoveries of Kepler.

It was Kepler who firſt diſcovered the true reaſon of the apparent places of objects ſeen by reflecting mirrors, as it depends upon the angle which the rays of light, iſſuing from the extreme part of an object, make with one another after ſuch reflections. In plane mirrors theſe rays are reflected with the ſame degree of inclination to one another that they had before their incidence; but he ſhows that this inclination is changed in convex and concave mirrors.

28. Of Mr Boyle.

Mr Boyle made ſome curious obſervations concerning the reflecting powers of differently coloured ſubſtances. Many learned men, he ſays, imagined that ſnow affects the eyes, not by a *borrowed*, but by a *native* light; but having placed a quantity of ſnow in a room, after which all foreign light was excluded, neither he nor any body elſe was able to perceive it. To try whether white bodies reflect more light than others, he held a ſheet of white paper in a ſun beam admitted into a darkened room; and obſerved that it reflected much more light than a paper of any other colour, a conſiderable part of the room being enlightened by it. Farther, To ſhow that white bodies reflect the rays outwards, he adds, that common burning glaſſes will not of a long time burn or diſcolour white paper. When he was a boy, he ſays, and took great pleaſure in making experiments with theſe glaſſes, he was much ſurpriſed at this remarkable circumſtance; and it ſet him very early upon gueſſing at the nature of whiteneſs, eſpecially as he obſerved that the image of the ſun was not ſo well defined upon white paper as upon black; and as, when he pu[illegible]k upon the paper, the moiſture would be quickly dried up, and the paper, which he could not burn before, would preſently take fire. He alſo found, that, by expoſing his hand to the ſun, with a thin black glove upon it, it would be ſuddenly and more conſiderably heated, than if he held his naked hand to the rays, or put on a glove of thin white leather.

To prove that black is the reverſe of white, with reſpect to its property of reflecting the rays of the ſun, he procured a large piece of black marble; and having got it ground into the form of a large ſpherical concave ſpeculum, he found that the image of the ſun reflected from it was far from offending or dazzling his eyes, as it would have done from another ſpeculum; and though this was large, he could not in a long time ſet a piece of wood on fire with it; though a far leſs ſpeculum, of the ſame form, and of a more reflecting ſubſtance, would preſently have made it flame.

To ſatisfy himſelf ſtill farther with reſpect to this ſubject, he took a broad and large tile; and having made one half of its ſurface white and the other black, he expoſed it to the ſummer ſun. And having let it lie there ſome time, he found, that while the whited part remained cool, the part that was black was grown very hot. For his farther ſatisfaction, he ſometimes left part of the tile of its native red; and, after expoſing the whole to the ſun, obſerved that this part grew hotter than the white, but was not ſo hot as the black part. He alſo obſerves, that rooms hung with black are not only darker than they would otherwiſe be, but warmer too; and he knew ſeveral perſons, who found great inconvenience from rooms hung with black. As another proof of his hypotheſis, he informs us, that a virtuoſo, of unſuſpected credit, acquainted him, that, in a hot climate, he had ſeen eggs well roaſted in a ſhort time, by firſt blacking the ſhells, and then expoſing them to the ſun.

29
Of the infuſion of lignum nephriticum.

We have already taken notice of the remarkable property of lignum nephriticum firſt obſerved by Kircher. (See Guilandina.) However, all his obſervations with regard to it fell very ſhort of Mr Boyle. He deſcribes this lignum nephriticum to be a whitiſh kind of wood, that was brought from Mexico, which the natives call *coatl* or *tlapazatli*, and which had been thought to tinge water of a green colour only; but he ſays that he found it to communicate all kinds of colours. If, ſays he, an infuſion of this wood be put into a glaſs globe, and expoſed to a ſtrong light, it will be as colourleſs as pure water; but if it be carried into a place a little ſhaded, it will be a moſt beautiful green. In a place ſtill more ſhaded, it will incline to red; and in a very ſhady place, or in an opaque veſſel, it will be green again.

A cup of this remarkable wood was ſent to Kircher by the procurator of his ſociety at Mexico, and was preſented by him to the emperor as a great curioſity. It is called *lignum nephriticum*, becauſe the infuſion of it was imagined to be of ſervice in diſeaſes of the kidneys and bladder, and the natives of the country where it grows do make uſe of it for that purpoſe.

Mr Boyle corrected ſeveral of the haſty obſervations of Kircher concerning the colours that appear in the infuſion of lignum nephriticum, and he diverſified the experiments with it in a very pleaſing manner. He firſt diſtinctly noted the two very different colours which this remarkable tincture exhibits by tranſmitted and reflected light. If, ſays he, it be held directly between the light and the eye, it will appear tinged (excepting the very top of it, where a ſky coloured circle ſometimes appears) almoſt of a golden colour, except the infuſion be too ſtrong; in which caſe it will be dark or reddiſh, and requires to be diluted with water. But if it be held from the light, ſo that the eye be between the light and the phial, it will appear of a deep lively blue colour; as will alſo the drops, if any lie on the outſide of the glaſs.

When a little of this tincture was poured upon a ſheet of white paper, and placed in a window where the ſun could ſhine upon it, he obſerved, that if he turned his back upon the ſun, the ſhadow of his pen, or any ſuch ſlender ſubſtance, projected upon the liquor, would not be all dark, like other ſhadows; but that part of it would be curiouſly coloured, the edge of it next the body being almoſt of a lively golden colour, and the more remote part blue. Theſe, and other experiments of a ſimilar nature, many of his friends, he ſays, beheld with wonder; and he remembered an excellent oculiſt, who accidentally meeting with a phial full of this liquor, and being unacquainted with this remarkable property of it, imagined, after he had viewed it a long time, that ſome new and ſtrange diſtemper had ſeized his eyes: and Mr Boyle himſelf acknowledges, that the oddneſs of this phenomenon made him very deſirous to find out the cauſe of it; and his inquiries were not altogether unſucceſsful.

Obſerving that this tincture, if it were too deep, was not tinged in ſo beautiful a manner, and that the impregnating virtue of the wood did, by being frequently infuſed in freſh water, gradually decay, he conjectured that the tincture contained much of the eſſential ſalt of the wood; and to try whether the ſubtle parts, on which the colour depended, were volatile enough to be diſtilled, without diſſolving their texture, he applied ſome of it to the gentle heat of a lamp furnace; but he found all that came over was as limpid and colourleſs as rock water, while that which remained behind was of ſo deep a blue, that it was only in a very ſtrong light that it appeared of any colour.

Suſpecting that the tinging particles abounded with ſalts, whoſe texture, and the colour thence ariſing, would probably be altered by acids, he poured into a ſmall quantity of it a very little ſpirit of vinegar, and found that the blue colour immediately vaniſhed, while the golden one remained, on which ever ſide it was viewed with reſpect to the light.

Upon this he imagined, that as the acid ſalts of the vinegar had been able to deprive the liquor of its blue colour, a ſulphureous ſalt, which is of a contrary nature, would deſtroy their effects; and having placed himſelf betwixt the window and the phial, and let fall into the ſame liquor a few drops of oil of tartar *per deliquium*, he found that it was immediately reſtored to its former blue colour, and exhibited all the ſame phenomena which it had done at the firſt.

Having ſometimes brought a round long-necked phial, filled with this tincture, into a darkened room, into which a beam of the ſun was admitted by a ſmall aperture; and holding the phial ſometimes near the ſun beams, and ſometimes partly in them and partly out of them, changing alſo the poſition of the glaſs, and viewing it from ſeveral parts of the room, it exhibited a much greater variety of colours than it did in an enlightened room. Beſides the uſual colours, it was red in ſome places and green in others, and within were intermediate colours produced by the different degrees and odd mixtures of light and ſhade.

It was not only in this tincture of lignum nephriticum that Mr Boyle obſerved the difference between reflected and tranſmitted light. He obſerved it even in gold, though no perſon explained the cauſe of theſe effects before Sir Iſaac Newton. He took a piece of leaf gold, and holding it betwixt his eye and the light, obſerved, that it did not appear of a golden colour, but of a greeniſh blue. He alſo obſerved the ſame change of colour by candle light; but the experiment did not ſucceed with a leaf of ſilver.

The conſtitution of the atmoſphere and of the ſea, we ſhall find, by obſervations made in later periods, to be ſimilar to that of this infuſion; for the blue rays, and others of a faint colour, do not penetrate ſo far into them as the red, and others of a ſtronger colour: but what this conſtitution is, which is common to them all, deſerves to be inquired into. For almoſt all other tinctures, and this of lignum nephriticum too, after ſome change made in it by Mr Boyle, as well as all other ſemi-tranſparent coloured ſubſtances, as glaſs, appear of the ſame hue in all poſitions of the eye. To increaſe or diminiſh the quantity makes no difference, but to make the colour deeper or more dilute.

30
Mr Boyle's account of the colours of thin plates.

The firſt diſtinct account of the colours exhibited by thin plates of various ſubſtances, are met with among the obſervations of Mr Boyle. To ſhow the chemiſts that colours may be made to appear or vaniſh, where there is no acceſſion or change either of the ſulphureous, the ſaline, or the mercurial principle of bodies, he obſerves, that all chemical eſſential oils, as alſo good ſpirit of wine, being ſhaken till they riſe in bubbles, appear of various colours; which immediately vaniſh when the bubbles burſt, ſo that a colourleſs liquor may be immediately made to exhibit a variety of colours, and loſe them in a moment, without any change in its eſſential principles. He then mentions the colours that appear in bubbles of ſoap and water, and alſo in turpentine. He ſometimes got glaſs blown ſo thin as to exhibit ſimilar colours; and obſerves, that a feather, of a proper ſhape and ſize, and alſo a black ribbon, held at a proper diſtance, between his eye and the ſun, ſhowed a variety of little rainbows, as he calls them, with very vivid colours, none of which were conſtantly to be ſeen in the ſame objects.

31
Dr Hooke's account of theſe colour

Much more pains were taken with this ſubject, and a much greater number of obſervations reſpecting it were made, by Dr Hooke. As he loved to give ſurpriſe by his diſcoveries, he promiſed, at a meeting of the ſociety on the 7th of March 1672, to exhibit, at their next meeting, ſomething which had neither reflection nor refraction, and yet was diaphanous. Accordingly, at the time appointed, he produced the famous coloured bubble of ſoap and water, of which ſuch admirable uſe was afterwards made by Sir Iſaac Newton, but which Dr Hooke and his contemporaries ſeem to have overlooked in Mr Boyle's treatiſe on colours, though it was publiſhed nine years before. It is no wonder that ſo curious an appearance excited the attention of that inquiſitive body, and that they ſhould deſire him to bring an account of it in writing at their next meeting.

By the help of a ſmall glaſs pipe, there were blown ſeveral ſmall bubbles, out of a mixture of ſoap and water; where it was obſervable, that, at firſt, they appeared white and clear; but that, after ſome time, the film of water growing thinner, there appeared upon it all the colours of the rainbow: Firſt, a pale yellow; then orange, red, purple, blue, green, &c. with the ſame ſeries of colours repeated; in which it was farther obſervable, that the firſt and laſt ſeries were very faint, and that the middlemoſt order or ſeries were very bright. After theſe colours had paſſed over the changes above-mentioned, the film of the bubble began to appear white again; and preſently, in ſeveral parts of this ſecond white film, there appeared ſeveral holes, which by degrees grew very big, ſeveral of them running into one another. After reciting other obſervations, which are not of much conſequence, he ſays it is ſtrange, that though both the encompaſſing and encompaſſed air have ſurfaces, yet he could not obſerve that they afforded either reflection or refraction, which all the other parts of the encompaſſed air did. This experiment, he ſays, at firſt ſight, may appear very trivial, yet, as to the finding out the nature and cauſe of reflection, refraction, colours, congruity and incongruity, and ſeveral other properties of bodies, he looked upon it as one of the moſt inſtructive. And he promiſed to conſider it more afterwards; but we do not find that ever he did; nor indeed is it to be much regretted, as we ſhall ſoon find this buſineſs in better hands. He adds, that that which gives one colour by reflection, gives another by trajection; not much unlike the tincture of lignum nephriticum.

Dr Hooke was the firſt to obſerve, if not to deſcribe, the beautiful colours that appear in thin plates of Muſcovy glaſs. Theſe he ſays, are very beautiful to the naked eye, but much more when they are viewed with a microſcope. With this inſtrument he could perceive that theſe colours were ranged in rings ſurrounding the white ſpecks or flaws in this thin ſubſtance, that the order of the colours were the very ſame as in the rainbow, and that they were often repeated ten times. But the colours, he ſays, were diſpoſed as in the outer bow, and not the inner. Some of them alſo were much brighter than others, and ſome of them very much broader. He alſo obſerved, that if there was a place where the colours were very broad, and conſpicuous to the naked eye, they might be made, by preſſing the place with the finger, to change places, and move from one part to another. Laſtly, He obſerved, that if great care be uſed, this ſubſtance may ſplit into plates of $\frac{1}{8}$ or $\frac{1}{6}$ of an inch in diameter, each of which will appear through a microſcope to be uniformly adorned with ſome one vivid colour, and that theſe plates will be found upon examination to be of the ſame thickneſs throughout.

As a fact ſimilar to this, but obſerved previous to it, we ſhall here mention that Lord Brereton, at a meeting of the Royal Society in 1666, produced ſome pieces of glaſs taken out of a window of a church, both on the north and on the ſouth ſide of it; obſerving, that they were all eaten in by the air, but that the piece taken from the ſouth ſide had ſome colours like thoſe of the rainbow upon it, which the others on the north ſide had not. This phenomenon has been frequently obſerved ſince, and in other circumſtances. It is not to be doubted, but that in all theſe caſes, the glaſs is divided into thin plates, which exhibit colours, upon the ſame principle with thoſe which Dr Hooke obſerved in the bubble of ſoap and water, and in the thin plate of glaſs, which we ſhall find more fully explained by Sir Iſaac Newton. With care the thin plates of the glaſs may be ſeparated, and the theory verified.

32 Why the ſtars are viſible by day at the bottom of a well.

An obſervation made by Otto Guericke, well explains the reaſon why ſtars are viſible at the bottom of a deep well. It is, ſays he, becauſe the light that proceeds from them is not overpowered by the rays of the ſun, which are loſt in the number of reflections which they muſt undergo in the pit, ſo that they can never reach the eye of a ſpectator at the bottom of it.

But of all thoſe who have given their attention to this ſubject of the reflection of light, none ſeems to have given ſuch ſatisfaction as M. Bouguer; and next to thoſe of Sir Iſaac Newton, his labours ſeem to have been the moſt ſucceſsful. The object of his curious and elaborate experiments was to meaſure the degrees of light, whether emitted, reflected, or refracted, by different bodies. They were originally occaſioned by an article of M. Mairan's in the Memoirs of the French Academy for 1721, in which the proportion of the light of the ſun at the two ſolſtices was ſuppoſed to be known; and his laudable attempt to verify what had been before taken for granted, ſuggeſted a variety of new experiments, and opened to him and to the world a new field of optical knowledge. His firſt production upon this ſubject was a treatiſe entitled *Eſſai d'Optique*, which was received with general approbation. Afterwards, giving more attention to this ſubject, he formed an idea of a much larger work, to which many more experiments were neceſſary: but he was prevented, by a variety of interruptions, from executing his deſign ſo ſoon as he had propoſed, and he had hardly completed it at the time of his death, in 1758; ſo that we are obliged to his friend M. de la Caille for the care of the publication. At length, however, it was printed at Paris in 1760, under the title of *Traité d'Optique*.

33 Diſcoveries of M. Bou-

At the entrance upon this treatiſe, we are induced to form the moſt pleaſing expectations from our author's experiments, by his account of the variety, the ſingular accuracy, and circumſpection, with which he made them; whereby he muſt, to all appearance, have guarded againſt every avenue to error, and particularly againſt thoſe objections to which the few attempts that had been made, of a ſimilar nature, before him had been liable. In order to compare different degrees of light, he always contrived to place the bodies from which it proceeded, or other bodies illuminated by them, in ſuch a manner as that he could view them diſtinctly at the ſame time; and he either varied the ſtances of theſe bodies, or modified their light in ſome other way, till he could perceive no difference between them. Then, conſidering their different diſtances, or the other circumſtances by which their light was affected, he calculated the proportion which they would have borne to each other at the ſame diſtance, or in the ſame circumſtances.

Plate CCCLII. fig. 3.

To aſcertain the quantity of light loſt by reflection, he placed the mirror, or reflecting ſurface, B, on which the experiment was to be made, truly upright; and having taken two tablets, of preciſely the ſame colour, or of an equal degree of whiteneſs, he placed them exactly parallel to one another at E and D, and threw light upon them by means of a lamp or candle, P, placed in a right line between them. He then placed himſelf ſo, that with his eye at A he could ſee the tablet E, and the image of the tablet D, reflected from the mirror B, at the ſame time; making them as it were, to touch one another. He then moved the candle along the line ED, ſo as to throw more or leſs light upon either of them, till he could perceive no difference in the ſtrength of the light that came to his eye from either of them. After this, he had nothing more to do than to meaſure the diſtances EP and DP; for the ſquares of thoſe diſtances expreſſed the degree in which the reflection of the mirror diminiſhed the quantity of light. It is evident, that if the mirror reflected all the rays it received, the candle P muſt have been placed at C, at an equal diſtance from each of the tablets, in order to make them appear equally illuminated; but becauſe much of the light is loſt in reflection, they can only be made to appear equally bright by placing the candle nearer the tablet D, which is ſeen by reflexion only.

Fig. 4.

To find how much light is loſt by oblique reflection, he took two equally poliſhed plates, D and E, and cauſed them to be enlightened by the candle P; and while one of them, D, was ſeen at A, by reflection from B, placed in a poſition oblique to the eye, the other, E, was ſo placed, as to appear contiguous to it; and removing the plate E, till the light which it reflected was no ſtronger than that which came from the image D, ſeen by reflection at B, he eſtimated the quantity of light that was loſt by this oblique reflection, by the ſquares of the diſtances of the two objects from the candle.

It need ſcarcely be added, that in theſe experiments all foreign light was excluded, that his eye was ſhaded, and that every other precaution was obſerved in order to make his concluſions unqueſtionable.

Fig. 5.

In order to aſcertain the quantity of light loſt by reflection with the greateſt exactneſs, M. Bouguer introduced two beams of light into a darkened room, as by the apertures P and Q; which he had ſo contrived, that he could place them higher and lower, and enlarge or contract them at pleaſure; and the reflecting ſurface (as that of a fluid contained in a veſſel) was placed horizontally at O, from whence the light coming through the hole P, was reflected to R, upon the ſcreen GH, where it was compared with another beam of light that fell upon S, through the hole Q; which he made ſo much leſs than P, as that the ſpaces S and R were equally illuminated; and by the proportion that the apertures P and Q bore to each other, he calculated what quantity of light was loſt by the reflection at O.

It was neceſſary, he obſerves, that the two beams of light PO and QS (which he uſually made 7 or 8 feet long) ſhould be exactly parallel, that they might come from two points of the ſky equally elevated above the horizon, and having preciſely the ſame intenſity of light. It was alſo neceſſary that the hole Q ſhould be a little higher than P, in order that the two images ſhould be at the ſame height, and near one another. It is no leſs neceſſary, he ſays, that the ſcreen CH be exactly vertical, in order that the direct and reflected beams may fall upon it, with the ſame inclination; ſince, otherwiſe, though the two lights were perfectly equal, they would not illuminate the ſcreen equally. This diſpoſition, he ſays, ſerves to anſwer another important condition in theſe experiments; for the direct ray QS muſt be of the ſame length with the ſum of the incident and reflected rays, PO and OR, in order that the quantity of light introduced into the room may be ſenſibly proportional to the ſizes of the apertures.

We ſhall now proceed to recite the reſult of the experiments which he made to meaſure the quantity of light that is loſt by reflection in a great variety of circumſtances; but we ſhall introduce them by the recital of ſome which were made previous to them on the diminution of light by reflection, and the tranſmiſſion of it to conſiderable diſtances through the air, by M. Buffon at the time that he was conſtructing his machine to burn at great diſtances, mentioned under the article *Burning Glaſs*.

34 Of M. Buffon.

Receiving the light of the ſun in a dark place, and comparing it with the ſame light of the ſun reflected by a mirror, he found that at ſmall diſtances, as four or five feet, about one half was loſt by reflection; as he judged by throwing two reflected beams upon the ſame place, and comparing them with a beam of direct light; for then the intenſity of them both ſeemed to be the ſame.

Having received the light at greater diſtances, as at 100, 200, and 300 feet, he could hardly perceive that it loſt any of its intenſity by being tranſmitted through ſuch a ſpace of air.

He afterwards made the ſame experiments with candles, in the following manner: He placed himſelf oppoſite to a looking glaſs, with a book in his hand, in a room perfectly dark; and having one candle lighted in the next room, at the diſtance of about 40 feet, he had it brought nearer to him by degrees, till he was juſt able to diſtinguiſh the letters of the book, which was then 24 feet from the candle. He then received the light of the candle, reflected by the looking glaſs, upon his book, carefully excluding all the light that was reflected from any thing elſe; and he found that the diſtance of the book from the candle, including the diſtance from the book to the looking glaſs (which was only half a foot) was in all 15 feet. He repeated the experiment ſeveral times, and always with nearly the ſame reſult; and therefore concluded, that the quantity of direct light is to that of reflected as 576 to 225; ſo that the light of five candles reflected from a plane mirror is about equal to that of two candles.

From theſe experiments it appeared, that more light was loſt by reflection of the candles than of the ſun, which M. Buffon thought was owing to this circumſtance that the light iſſuing from the candle diverges, and therefore falls more obliquely upon the mirror than the light of the ſun, the rays of which are nearly parallel.

Theſe experiments and obſervations of M. Buffon are curious; though it will be ſeen that they fall far ſhort of thoſe of M. Bouguer, both in extent and accuracy. We ſhall begin with thoſe which we made to aſcertain the difference in the quantity of light reflected by glaſs and poliſhed metal.

35 Mr Bouguer's diſcoveries concerning the reflection of glaſs and poliſhed metal.

Uſing a ſmooth piece of glaſs one line in thickneſs, he found, that when it was placed at an angle of 15 degrees with the incident rays, it reflected 628 parts of 1000 which fell upon it; at the ſame time that a metallic mirror, which he tried in the ſame circumſtances, reflected only 561 of them. At a leſs angle of incidence much more light was reflected: ſo that at an angle of three degrees the glaſs reflected 700 parts, and the metal ſomething leſs, as in the former caſe.

Trying the reflection of bodies that were not poliſhed, he found that a piece of white plaſter, placed at an angle of 75°, with the incident rays, reflected $\frac{1}{210}$ part of the light that is received from a candle nine inches from it. White paper, in the ſame circumſtances, reflected it the ſame proportion; but at the diſtance of three inches, they both reflected 150 parts of 1000 that were incident.

Proceeding to make farther obſervations on the ſubject of reflected light, he premiſes the two following theorems, which he demonſtrates geometrically. 1. When the luminous body is at an infinite diſtance, and its light is received by a globe, the ſurface of which has a perfect poliſh, and abſorbs no light, it reflects the light equally in all directions, provided it be received at a conſiderable diſtance. He only excepts the place where the ſhadow of the globe falls; but this, he ſays, is no more than a ſingle point, with reſpect to the immenſity of the ſpherical ſurface which receives its light.

2. The quantity of light reflected in one certain direction will always be exactly the ſame, whether it be reflected by a very great number of ſmall poliſhed hemiſpheres, by a leſs number of larger hemiſpheres, or by a ſingle hemiſphere, provided they occupy the ſame baſe, or cover the ſame ground plan.

The uſe he propoſes to make of theſe theorems is to aſſiſt him in diſtinguiſhing whether the light reflected from bodies be owing to the extinction of it within them, or whether the roughneſs or eminences which cover them have not the ſame effect with the ſmall poliſhed hemiſpheres above mentioned.

He begins with obſerving, that, of the light reflected from Mercury, $\frac{1}{4}$ at leaſt is loſt, and that probably no ſubſtances reflect more than this. The rays were received at an angle of $11\frac{1}{2}$ degrees of incidence, that is meaſured from the ſurface of the reflecting body, and not from the perpendicular, which, he ſays, is what we are from this place to underſtand whenever he mentions the angle of incidence.

36 Great difference in the reflective power of ſubſtances according to the angle of incidence.

The moſt ſtriking obſervations which he made with reſpect to this ſubject, are thoſe which relate to the very great difference in the quantity of light reflected at different angles of incidence. In general, he ſays, that reflection is ſtronger at ſmall angles of incidence, and weaker at large ones. The difference is exceſſive when the rays ſtrike the ſurface of tranſparent ſubſtances,

ſtances, with different degrees of obliquity; but it is almoſt as great in ſome opaque ſubſtances, and it was always more or leſs ſo in every thing that he tried. He found the greateſt inequality in black marble; in which he was aſtoniſhed to find, that with an angle of 3° 35′ of incidence, though not perfectly poliſhed, yet it reflected almoſt as well as quickſilver. Of 1000 rays which it received, it returned 600; but when the angle of incidence was 14 degrees, it reflected only 156: when it was 30, it reflected 51; and when it was 80, it reflected only 23.

Similar experiments made with metallic mirrors always gave the differences much leſs conſiderable. The greateſt was hardly ever an eighth or a ninth part of it, but they were always in the ſame way.

The great difference between the quantity of light reflected from the ſurface of water, at different angles of incidence, is truly ſurpriſing; but our author obſerves, that this difference was greater when the ſmalleſt inclinations were compared with thoſe which were near to a right angle. He ſometimes ſuſpected, that, at very ſmall angles of incidence, the reflection from water was even greater than from quickſilver. All things conſidered, he thought it was not quite ſo great, though it was very difficult to determine the preciſe difference between them. In very ſmall angles, he ſays, that water reflects nearly $\frac{3}{4}$ of the direct light.

There is no perſon, he ſays, but has ſometimes felt the force of this ſtrong reflection from water, when he has been walking in ſtill weather on the brink of a lake oppoſite to the ſun. In this caſe, the reflected light is $\frac{1}{3}$, $\frac{1}{2}$, or ſometimes a greater proportion of the light that comes directly from the ſun, which is an addition to the direct rays of the ſun that cannot fail to be very ſenſible. The direct light of the ſun diminiſhes gradually as it approaches the horizon, while the reflected light at the ſame time grows ſtronger: ſo that there is a certain elevation of the ſun, in which the united force of the direct and reflected light will be the greateſt poſſible, and this he ſays is 12 or 15 degrees.

On the other hand, the light reflected from water at great angles of incidence is extremely ſmall. Our author was aſſured, that, when the light was perpendicular, it reflected no more than the 37th part that quickſilver does in the ſame circumſtances; for it did not appear, from all his obſervations, that water reflects more than the 60th, or rather the 55th, part of perpendicular light. When the angle of incidence was 50 degrees, the light reflected from the ſurface of water was about the 32d part of that which mercury reflected; and as the reflection from water increaſes with the diminution of the angle of incidence, it was twice as ſtrong in proportion at 39 degrees; for it was then the 16th part of the quantity that mercury reflected.

In order to procure a common ſtandard by which to meaſure the proportion of light reflected from various fluid ſubſtances, he pitched upon water as the moſt commodious; and partly by obſervation, and partly by calculation, which he always found to agree with his obſervations, he drew up the following table of the quantity of light reflected from the ſurface of water, at different angles with the ſurface.

Angles of incidence.	Rays reflected of 1000.	Angles of incidence.	Rays reflected of 1000.
$\frac{1}{2}$	721	17 $\frac{1}{2}$	178
1	692	20	145
1 $\frac{1}{2}$	669	25	97
2	639	30	65
2 $\frac{1}{2}$	614	40	34
5	501	50	22
7 $\frac{1}{2}$	409	60	19
10	333	70	18
12 $\frac{1}{2}$	271	80	18
15	211	90	18

In the ſame manner, he drew up the following table of the quantity of light reflected from the looking glaſs not quickſilvered.

Angles of incidence.	Rays reflected of 1000.	incidence	flected of 1000.
2 $\frac{1}{2}$	584	30	112
5	543	40	57
7 $\frac{1}{2}$	474	50	34
10	412	60	27
12 $\frac{1}{2}$	356	70	25
15	299	80	25
20	212	90	25
25	157		

Pouring a quantity of water into a veſſel containing quickſilver, it is evident that there will be two images of any object ſeen by reflection from them, one at the ſurface of the water, and the other at that of the quickſilver. In the largeſt angles of incidence, the image at the ſurface of the water will diſappear, which will happen when it is about a 60th or an 80th part leſs luminous than the image at the ſurface of the quickſilver. Depreſſing the eye, the image on the water will grow ſtronger, and that on the quickſilver weaker in proportion; till at laſt, the latter will be incomparably weaker than the former, and at an angle of about 10 degrees they will be equally luminous. According to the table, $\frac{333}{1000}$ of the incident rays are reflected from the water at this angle of 10 degrees. At the ſurface of the mercury they were reduced to 500; and of theſe, part being reflected back upon it from the under ſurface of the water, only 333 remained to make the image from the mercury.

37 Reflection of images by the air.

It has been obſerved by ſeveral perſons, particularly by Mr Edwards, (ſee Phil. Tranſ. Vol. LIII. p. 229.) that there is a remarkably ſtrong reflection into water, with reſpect to rays iſſuing from the water; and perſons under water have ſeen images of things in the air in a manner peculiarly diſtinct and beautiful: but this fact had not been obſerved with a ſufficient degree of attention, till it came into M. Bouguer's way to do it, and he acknowledges it to be very remarkable. In this caſe, he ſays, that from the ſmalleſt angles of incidence, to a certain number of degrees, the greateſt part of the rays are reflected, perhaps in as great a proportion as at the ſurface of metallic mirrors, or of quickſilver; while the other part, which does not eſcape into the air, is extinguiſhed or abſorbed; ſo that the ſurface of the tranſparent body appears opaque on the inſide. If the angle of incidence be increaſed only a few degrees, the ſtrong reflection ceaſes altogether, a great number of rays eſcape into the air, and very few are abſorbed or extinguiſhed. In proportion as the angle of incidence is farther increaſed, the quantity of the light reflected becomes leſs and leſs; and when it is near 90 degrees, almoſt all the rays eſcape out of the tranſparent body, its ſurface loſing almoſt all its power of reflection, and becoming almoſt as tranſparent as it is in other caſes, or when the light falls upon it from without.

38
Extinction of the rays of light at the ſurface of tranſparent bodies.

This property belonging to the ſurfaces of tranſparent bodies, of abſorbing or extinguiſhing the rays of light, is truly remarkable, and, as there is reaſon to believe, had not been noticed by any perſon before M. Bouguer. It had been conjectured by Sir Iſaac Newton that rays of light become extinct only by impinging upon the ſolid parts of bodies; but theſe obſervations of M. Bouguer ſhow that the fact is quite otherwiſe; and that this effect is to be attributed, not to the ſolid parts of bodies, which are certainly more numerous in a long tract of water than juſt in the paſſage out of water into air, but to ſome power lodged at the ſurfaces of bodies only, and therefore probably the ſame with that which reflects, refracts, and inflects the light.

39
Strong reflection by a priſm.

One of the above-mentioned obſervations, viz. all the light being reflected at certain angles of incidence from air into denſer ſubſtances, had frequently been made, eſpecially in glaſs priſms; ſo that Newton made uſe of one of them, inſtead of a reflecting mirror, in the conſtruction of his teleſcope. If a beam of light fall upon the air from within theſe priſms, at an angle of 10, 20, or 30 degrees, the effect will be nearly the ſame as at the ſurface of quickſilver, a fourth or a third of the rays being extinguiſhed, and $\frac{2}{3}$ or $\frac{3}{4}$ths reflected. This property retains its full force as far as an incidence of 49° 49′, (ſuppoſing the proportion of the ſines of the refraction to be 31 and 20 for the mean refrangible rays); but if the angle of incidence be increaſed but one degree, the quantity of light reflected inwards decreaſes ſuddenly, and a great part of the rays eſcape out of the glaſs, ſo that the ſurface becomes ſuddenly tranſparent.

All tranſparent bodies have the ſame property, with this difference, that the angle of incidence at which the ſtrong reflection ceaſes, and at which the light which is not reflected is extinguiſhed, is greater in ſome than in others. In water this angle is about 41° 32′; and in every medium it depends ſo much on the invariable proportion of the ſine of the angle of refraction to the ſine of the angle of incidence, that this law alone is ſufficient to determine all the phenomena of this new circumſtance, at leaſt as to this accidental opacity of the ſurface.

When our author proceeded to meaſure the quantity of light reflected by theſe internal ſurfaces at great angles of incidence, he found many difficulties, eſpecially on account of the many alterations which the light underwent before it came to his eye: but at length, uſing a plate of cryſtal, he found, that, at an angle of 75 degrees, this internal reflection diminiſhed the light 27 or 28 times; and as the external reflection at the ſame angle diminiſhed the light only 26 times, it follows that the internal reflection is a little ſtronger than the other.

Repeating theſe experiments with the ſame and different pieces of cryſtal, he ſometimes found the two reflections to be equally ſtrong; but, in general, the internal was the ſtronger. Alſo, the image reflected internally was always a little redder than an object which was ſeen directly through the plate of cryſtal.

40
Of the quantity of light reflected by different ſubſtances.

Reſuming his obſervations on the diminution of light, occaſioned by the reflection of opaque bodies obliquely ſituated, he compared it with the appearances of ſimilar ſubſtances which reflected the light perpendicularly. Uſing pieces of ſilver made very white, he found, that, when one of them was placed at an angle of 75 degrees with reſpect to the light, it reflected only 640 parts out of 1000. He then varied the angle, and alſo uſed white plaſter and fine Dutch paper, and drew up the following table of the proportion of the light reflected from each of thoſe ſubſtances at certain angles.

QUANTITY of LIGHT reflected from

Angles of incidence.	Silver.	Plaſter.	Dutch Paper.
90	1000	1000	1000
75	802	762	971
60	640	640	743
45	455	529	507
30	319	352	332
15	209	194	203

Suppoſing the aſperities of opaque bodies to conſiſt of very ſmall planes, it appears from theſe obſervations, that there are fewer of them in thoſe bodies which reflect the light at ſmall angles of incidence than at greater; and our author ſays, that the caſe was nearly the ſame with reſpect to all the opaque bodies that he tried. None of them had their roughneſs equivalent to ſmall hemiſpheres, which would have diſperſed the light equally in all directions; and, from the *data* in the preceding table, he deduces mathematically the number of the little planes that compoſe thoſe ſurfaces, and that are inclined to the general ſurface at the angles above-mentioned, ſuppoſing that the whole ſurface contains 1000 of them that are parallel to itſelf, ſo as to reflect the light perpendicularly, when the luminous body is ſituated at right angles with reſpect to it. His concluſions reduced to a table, correſponding to the preceding, are as follow:

Inclinations of the ſmall ſurfaces with reſpect to the large one.	The diſtribution of the ſmall planes that conſtitute the aſperities of the opaque ſurface in the		
	Silver.	Plaſter.	Paper.
0	1000	1000	1000
15	777	736	937
30	554	554	545
45	333	374	358
60	161	176	166
75	53	50	52

Theſe variations in the number of little planes, or ſurfaces, he expreſſes in the form of a curve; and afterwards he ſhows, geometrically, what would be the effect if the bodies were enlightened in one direction, and viewed in another; upon which ſubject he has ſeveral curious theorems and problems: as, the poſition of the eye being given, to find the angle at which the luminous body muſt be placed, in order to its reflecting the moſt light; or, the ſituation of the luminous body being given, to find a proper ſituation for the eye, in order to ſee the moſt enlightened, &c. But it would carry us too far into geometry to follow him through all theſe diſquiſitions.

41 Obſervations concerning the planets, &c.

Since the planets, as the accurate obſerver takes notice, are more luminous at their edges than at their centres, he concludes, from the above-mentioned principles, that the bodies which form them are conſtituted in a manner different from ours; particularly that their opaque ſurfaces conſiſt of ſmall planes, more of which are inclined to the general ſurface than they are in terreſtrial ſubſtances; and that there are in them an infinity of points, which have exactly the ſame ſplendour.

Our philoſopher and geometrician next proceeds to aſcertain the quantity of ſurface occupied by the ſmall planes of each particular inclination, from conſidering the quantity of light reflected by each, allowing thoſe that have a greater inclination to the common ſurface to take up proportionably leſs ſpace than thoſe which are parallel to it. And comparing the quantity of light that would be reflected by ſmall planes thus diſpoſed, with the quantity of light that was actually reflected by the three ſubſtances above-mentioned, he found that plaſter, notwithſtanding its extreme whiteneſs, abſorbs much light; for that, of 1000 rays that fall upon it, of which 166 or 167 ought to be reflected at an angle of 77 degrees, only 67 are in fact returned; ſo that 100 out of 167 were extinguiſhed, that is, about three-fifths.

With reſpect to the planets, our author concludes, that of 300,000 rays which the moon receives, 172,000 are abſorbed, or perhaps 204,100.

42 Of the ſurfaces of bodies.

Having conſidered the ſurfaces of bodies as conſiſting of planes only, he thus explains himſelf.—Each ſmall ſurface, ſeparately taken, is extremely irregular, and ſome of them are really concave, and others convex; but, in reducing them to a middle ſtate, they are to be conſidered as planes. Nevertheleſs he conſiders them as planes only with reſpect to the reception of the rays; for as they are almoſt all curves, and as, beſides this, many of thoſe whoſe ſituation is different from others contribute to the ſame effect, the rays always iſſue from an actual or imaginary focus, and after reflection always diverge from another.

If it be aſked, what becomes of thoſe rays that are reflected from one aſperity to another? he ſhows that very few of the rays can be in thoſe circumſtances; ſince they muſt fall upon planes which have more than 45 degrees of obliquity to the ſurface, of which there are very few in natural bodies. Theſe rays muſt alſo fall at the bottom of thoſe planes, and muſt meet with other planes ſimilarly ſituated to receive them; and conſidering the great irregularity of the ſurfaces of opaque bodies, it may be concluded that very few of the rays are thus reflected upon the body itſelf; and that the little that is ſo reflected is probably loſt to the ſpectators, being extinguiſhed in the body.

43 Mr Melville's obſervations on the manner in which bodies are heated by light.

We are obliged to Mr Melville for ſome ingenious obſervations on the manner in which bodies are heated by light. He obſerves, that, as each colorific particle of an opaque body muſt be ſomewhat moved by the reflection of the particles of light, when it is reflected backwards and forwards between the ſame particles, it is manifeſt that they muſt likewiſe be agitated with a vibratory motion, and the time of a vibration will be equal to that which light takes up in moving from one particle of a body to another adjoining. This diſtance, in the moſt ſolid opaque bodies, cannot be ſuppoſed greater than $\frac{1}{12500}$th of an inch, which ſpace a particle of light deſcribes in the $\frac{1}{125000000000000}$th of a ſecond. With ſo rapid a motion, therefore, may the internal parts of bodies be agitated by the influence of light, as to perform 125,000,000,000,000 vibrations, or more, in a ſecond of time.

The arrival of different particles of light at the ſurface of the ſame colorific particle, in the ſame or different rays, may diſturb the regularity of its vibrations, but will evidently increaſe their frequency, or raiſe ſtill ſmaller vibrations among the parts which compoſe thoſe particles; by which means the inteſtine motion will become more ſubtle, and more thoroughly diffuſed. If the quantity of light admitted into the body be increaſed, the vibrations of the particles muſt likewiſe increaſe in magnitude and velocity, till at laſt they may be ſo violent, as to make all the component particles daſh one another to pieces by their mutual colliſion; in which caſe, the colour and texture of the body muſt be deſtroyed.

Since there is no reflection of light but at the ſurface of a medium, the ſame perſon obſerves, that the greateſt quantity of rays, though crowded into the ſmalleſt ſpace, will not of themſelves produce any heat. From hence it follows, that the portion of air which lies in the focus of the moſt potent ſpeculum, is not at all affected by the paſſage of light through it, but continues of the ſame temperature with the ambient air; though any opaque body, or even any tranſparent body denſer than air, when put in the ſame place, would be intenſely heated in an inſtant.

This conſequence, evidently flowing from the plaineſt and moſt certain principles, not ſeeming to have been rightly underſtood by many philoſophers, and even the ſilence of moſt phyſical writers concerning this paradoxical truth making it probable that they were unacquainted with it, he thought it worth his while to ſay ſomething in explication of it. He obſerves, that the eaſieſt way to be ſatisfied of the matter experimentally is, to hold a hair, or a piece of down, immediately above the focus of a lens or ſpeculum, or to blow a ſtream of ſmoke from a pipe horizontally over it; for if the air in the focus were hotter than the ſurrounding fluid, it would continually aſcend upon account of its rarefaction, and thereby ſenſibly agitate thoſe ſlender bodies. Or a lens may be ſo placed as to form its focus within a body of water, or ſome other tranſparent ſubſtance, the heat of which may be examined from time to time with a thermometer; but care muſt be taken, in this experiment, to hold the lens as near as poſſible to the tranſparent body, leſt the rays, by falling cloſer than ordinary on its ſurface, ſhould warm it more than the common ſunbeams (B).

To apply theſe obſervations to the explication of natural phenomena, he obſerves, that the atmoſphere is not much warmed by the paſſage of the ſun's light through it, but chiefly by its contact with the heated ſurface of the globe. This, he thought, furniſhed one very ſimple and plauſible reaſon why it is coldeſt in all climates on the tops of very high mountains; namely, becauſe they are removed to the greateſt diſtance from the general ſurface of the earth. For it is well known, that a fluid heated by its contact with a ſolid body, decreaſes in heat in ſome inverſe proportion to the diſtance from the body. He himſelf found, by repeated trials, that the heat of water in deep lakes decreaſes regularly from the ſurface downwards. But to have this queſtion fully determined, the temperature of the air in the valley and on the mountain top muſt be obſerved every hour, both night and day, and carefully compared together.

From this doctrine he thinks it reaſonable to ſuppoſe, that the heat produced by a given number of rays, in an opaque body of a given magnitude, muſt be greater when the rays are more inclined to one another, than when they are leſs ſo; for the direction of the vibrations raiſed by the action of the light, whether in the colorific particles, or thoſe of an inferior order, will more interfere with one another; from whence the inteſtine ſhocks and colliſions muſt increaſe. Beſides this, the colorific particles of opaque bodies being diſpoſed in various ſituations, perhaps, upon the whole, the rays will fall more directly on each, the more they are inclined to one another. Is not this, ſays he, the reaſon of what has been remarked by philoſophers, that the heat of the ſun's light, collected into a cone, increaſes in approaching the focus in a much higher proportion than according to its denſity? That the difference of the angle in which the rays fall on any particle of a given magnitude, placed at different diſtances from the focus, is but ſmall, is no proof that the phenomenon cannot be aſcribed to it; ſince we know not in what high proportion one or both the circumſtances now mentioned may operate. However, that it proceeds not from any unknown action of the rays upon one another, as has been inſinuated, is evident from this, that each particular ray, after paſſing through the focus, preſerves its own colour and its own direction, in the ſame manner as if it were alone.

44
Abbé Nollet's experiments with burning glaſſes.

The attempts of the Abbé Nollet to fire inflammable ſubſtances by the power of the ſolar rays collected in the foci of burning mirrors, have a near relation to the preſent ſubject. Conſidering the great power of burning mirrors and lenſes, eſpecially thoſe of late conſtruction, it will appear ſurpriſing that this celebrated experimental philoſopher ſhould not be able to fire any liquid ſubſtance. But though he made the trial with all the care imaginable on the 19th of February 1757, he was not able to do it either with ſpirit of wine, olive oil, oil of turpentine, or ether; and though he could fire ſulphur, yet he could not ſucceed with Spaniſh wax, roſin, black pitch, or ſuet. He both threw the focus of theſe mirrors upon the ſubſtances themſelves, and alſo upon the fumes that roſe from them; but all the effect was, that the liquor boiled, and was diſperſed in vapour or very ſmall drops, but would not take fire. When linen rags, and other ſolid ſubſtances, were moiſtened with any of theſe inflammable liquids, they would not take fire till the liquid was diſperſed in a copious fume; ſo that rags thus prepared were longer in burning than thoſe that were dry.

45
M. Beaume's experiments.

M. Beaume, who aſſiſted M. Nollet in ſome of theſe experiments, obſerved farther, that the ſame ſubſtances which were eaſily fired by the flame of burning bodies, could not be ſet on fire by the contact of the hotteſt bodies that did not actually flame. Neither ether nor ſpirit of wine could be fired with a hot coal, or even red hot iron, unleſs they were of a white heat. From theſe experiments our author concludes, that, ſuppoſing the electric matter to be the ſame thing with fire or light, it muſt fire ſpirit of wine by means of ſome other principle. The members of the academy Del Cimento had attempted to fire ſeveral of theſe ſubſtances, though without ſucceſs; but this was ſo early in the hiſtory of philoſophy, that nobody ſeems to have concluded, that, becauſe they failed in this attempt, the thing could not be done. However, the Abbé informs us, that he read an account of his experiments to the Royal Academy at Paris ſeveral years before he attended to what had been done by the Italian philoſophers.

46
Bodies which ſeem to touch one another are not in actual contact.

By the help of optical principles, and eſpecially by obſervations on the reflection of light, Mr Melville diſcovered that bodies which ſeem to touch one another are not always in actual contact. "It is common (ſays he) to admire the volubility and luſtre of drops of rain that lie on the leaves of colewort, and ſome other vegetables;" but no philoſopher, as far as he knew, had put himſelf to the trouble of explaining this curious phenomenon. Upon inſpecting them narrowly, he found that the luſtre of the drop is produced by a copious reflection of light from the flattened part of its ſurface contiguous to the plant. He obſerved farther, that, when the drop rolls along a part which has been wetted, it immediately loſes all its luſtre, the green plant being then ſeen clearly through it; whereas, in the other caſe, it is hardly to be diſcerned.

From theſe two obſervations put together, he concluded, that the drop does not really touch the plant, when it has the mercurial appearance, but is ſuſpended in the air at ſome diſtance from it by the force of a repulſive power. For there could not be any copious reflection of white light from its under ſurface, unleſs there were a real interval between it and the ſurface of the plant.

If that ſurface were perfectly ſmooth, the under ſurface of the drop would be ſo likewiſe, and would therefore ſhow an image of the illuminating body by reflection

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(B) To theſe obſervations objections might be made, which it would not perhaps be eaſy to anſwer; but we are at preſent giving only the *hiſtory* of optics.

reflection, like a piece of poliſhed ſilver; but as it is conſiderably rough and unequal, the under ſurface becomes rough likewiſe, and ſo, by reflecting the light copiouſly in different directions, aſſumes the reſplendent white colour of unpoliſhed ſilver.

It being thus proved by an optical argument, that the drop is not really in contact with the plant which ſupports it, it may eaſily be conceived whence its volubility ariſes, and why it leaves no moiſture where it rolls.

47 Two curious miſcellaneous obſervations. Before we conclude the hiſtory of the obſervations concerning the reflection of light, we muſt not omit to take notice of two curious miſcellaneous ones. Baron Alexander Funk, viſiting ſome ſilver mines in Sweden, obſerved, that, in a clear day, it was as dark as pitch underground, in the eye of a pit, at 60 or 70 fathoms deep; whereas, in a cloudy or rainy day, he could even ſee to read at 106 fathoms deep. Inquiring of the miners, he was informed that this is always the caſe; and, reflecting upon it, he imagined that it aroſe from this circumſtance, that when the atmoſphere is full of clouds, light is reflected from them into the pit in all directions, and that thereby a conſiderable proportion of the rays are reflected perpendicularly upon the earth; whereas, when the atmoſphere is clear, there are no opaque bodies to reflect the light in this manner, at leaſt in a ſufficient quantity; and rays from the ſun itſelf can never fall perpendicularly in that country. The other was that of the ingenious Mr Grey, who makes ſuch a figure in the hiſtory of electricity. This gentleman took a piece of ſtiff brown paper, and pricking a ſmall hole in it, he held it at a little diſtance before him; when, applying a needle to his eye, he was ſurpriſed to ſee the point of it inverted. The nearer the needle was to the hole, the more it was magnified, but the leſs diſtinct; and if it was ſo held, as that its image was near the edge of the hole, its point ſeemed crooked. From theſe appearances he concluded, that theſe ſmall holes, or ſomething in them, produce the effects of concave ſpeculums; and from this circumſtance he took the liberty to call them *aërial ſpeculums*.

§ 4. *Diſcoveries concerning the Inflection of Light.*

This property of light was not diſcovered till about the middle of the laſt century. The perſon who firſt made the diſcovery was Father Grimaldi; at leaſt he firſt publiſhed an account of it in his treatiſe *De lumine, coloribus, et iride,* printed in 1666. Dr Hooke, however, laid claim to the ſame diſcovery, though he did not publiſh his obſervations till ſix years after Grimaldi; having probably never ſeen his performance.

48 Dr Hooke's diſcoveries. Dr Hooke having made his room completely dark, admitted into it a beam of the ſun's light by a very ſmall hole in a braſs plate fixed in the window-ſhutter. This beam ſpreading itſelf, formed a cone, the apex of which was in the hole, and the baſe was on a paper, ſo placed as to receive it at ſome diſtance. In this image of the ſun, thus painted on the paper, he obſerved that the middle was much brighter than the edges, and that there was a kind of dark penumbra about it, of about a 16th part of the diameter of the circle; which penumbra, he ſays, muſt be aſcribed to a property of light, which he promiſed to explain.—Having obſerved this, at the diſtance of about two inches from the former he let in another cone of light; and receiving the baſes of them, at ſuch a diſtance from the holes as that the circles interſected each other, he obſerved that there was not only a penumbra, or darker ring, encompaſſing the lighter circle, but a manifeſt dark line, or circle, which appeared even where the limb of the one interfered with that of the other. This appearance is diſtinctly repreſented, fig. 6. Plate CCLII.

Comparing the diameter of this baſe with its diſtance from the hole, he found it to be by no means the ſame as it would have been if it had been formed by ſtraight lines drawn from the extremities of the ſun's diſk, but varied with the ſize of the holes, and the diſtance of the paper.

Struck with this appearance, he proceeded to make farther experiments concerning the nature of light thus tranſmitted. To give a juſt idea of which he held an opaque body BB, fig. 7. ſo as to intercept the light that entered at a hole in the window ſhutter O, and was received on the ſcreen AP. In theſe circumſtances, he obſerved, that the ſhadow of the opaque body (which was a round piece of wood, not bright or poliſhed) was all over ſomewhat enlightened, but more eſpecially towards the edge. Some perſons who were preſent, imagining that this light within the ſhadow might be produced by ſome kind of reflection from the ſide of this opaque body, on account of its roundneſs; and others ſuppoſing it might proceed from ſome reflection from the ſides of the hole in the piece of braſs through which the light was admitted into the room; to obviate both theſe objections, he admitted the light through a hole burnt in a piece of paſteboard, and intercepted it with a razor which had a very ſharp edge; but ſtill the appearances were the very ſame as before: ſo that, upon the whole, he concluded that they were occaſioned by a new property of light, different from any that had been obſerved by preceding writers.

He farther diverſified this experiment, by placing the razor ſo as to divide the cone of light into two parts, the hole in the ſhutter remaining as before, and placing the paper ſo as that none of the enlightened part of the circle fell upon it, but only the ſhadow of the razor; and, to his great ſurpriſe, he obſerved what he calls a *very briſk and viſible radiation* ſtriking down upon the paper, of the ſame breadth with the diameter of the lucid circle; and this radiation always ſtruck perpendicularly from the line of ſhadow, and, like the tail of a comet, extended more than 10 times, and probably more than 100 times the breadth of the remaining part of the circle: nay, as far as he could find, by many trials, the light from the edge ſtruck downwards into the ſhadow very near to a quadrant, though the greater were the deflections of this new light from the direct radiations of the cone, the more faint they were.

Obſerving this appearance with more attention, he found, wherever there was a part of the interpoſed body higher than the reſt, that, oppoſite to it, the radiation of light into the ſhadow was brighter, as in the figure; and wherever there was a notch or gap in it, there would be a dark ſtroke in the half-enlightened ſhadow. From all theſe appearances, he concluded, that they were to be aſcribed to a new property of light, whereby it is deflected from ſtraight lines, contrary to what had been before aſſerted by optical writers.

It does not appear, however, that our philoſopher ever proſecuted this experiment to any purpoſe; as all that we find of his on the ſubject of light, after this time, are ſome crude thoughts which he read at a meeting of the Royal Society, on the 18th of March 1675; which, however, as they are only ſhort hints, we ſhall copy.

They conſiſt of eight articles; and, as he thought, contained an account of ſeveral properties of light that had not been noticed before. There is a deflection of light, differing both from reflection and refraction, and ſeeming to depend on the unequal denſity of the conſtituent parts of the ray, whereby the light is diſperſed from the place of condenſation, and rarefied, or gradually diverged into a quadrant. 2. This deflection is made towards the ſuperficies of the opaque body perpendicularly. 3. Thoſe parts of the diverged radiations which are deflected by the greateſt angle from the ſtraight or direct radiations are the fainteſt, and thoſe that are deflected by the leaſt angles are the ſtrongeſt. 4. Rays cutting each other in one common foramen do not make the angles at the vertex equal. 5. Colours may be made without refraction. 6. The diameter of the ſun cannot be truly taken with common ſights. 7. The ſame rays of light, falling upon the ſame point of an object, will turn into all ſorts of colours, by the various inclinations of the object. 8. Colours begin to appear when two pulſes of light are blended ſo well, and ſo near together, that the ſenſe takes them for one.

49
Grimaldi's
diſcoveries.
Plate
CCCLII.

We ſhall now proceed to the diſcoveries of Father Grimaldi. Having introduced a ray of light, through a very ſmall hole, AB, fig. 8. into a darkened room, he obſerved that the light was diffuſed in the form of a cone, the baſe of which was CD; and that if any opaque body, FE, was placed in this cone of light, at a conſiderable diſtance from the hole, and the ſhadow was received upon a piece of white paper, the boundaries of it were not confined within GH, or the penumbra IL, occaſioned by the light proceeding from different parts of the aperture, and of the diſk of the ſun, but extended to MN; at which he was very much ſurpriſed, ſuſpecting, and finding by calculation, that it was conſiderably broader than it could have been made by rays paſſing in right lines by the edges of the object.

But the moſt remarkable circumſtance in this appearance was, that upon the lucid part of the baſe, CM and ND, ſtreaks of coloured light were plainly diſtinguiſhed, each being terminated by blue on the ſide next to the ſhadow, and by red on the other; and though theſe coloured ſtreaks depended, in ſome meaſure, on the ſize of the aperture AB, becauſe they could not be made to appear if it was large, yet he found that they were not limited either by it, or by the diameter of the ſun's diſk.

He farther obſerved, that theſe coloured ſtreaks were not all of the ſame breadth, but grew narrower as they receded from the ſhadow, and were each of them broader the farther the ſhadow was received from the opaque body, and alſo the more obliquely the paper on which they were received was held with reſpect to it. He never obſerved more than three of theſe ſtreaks.

To give a clearer idea of theſe coloured ſtreaks, he drew the repreſentation of them, exhibited in fig. 9. in which NMO repreſents the broadeſt and moſt luminous ſtreak, next to the dark ſhadow X. In the ſpace in which M is placed there was no diſtinction of colour, but the ſpace NN was blue, and the ſpace OO, on the other ſide of it, was red. The ſecond ſtreak, QPR was narrower than the former; and of the three parts of which it conſiſted, the ſpace P had no particular colour, but QQ was a faint blue, and RR a faint red. The third ſtreak, TSV, was exactly ſimilar to the two others, but narrower than either of them, and the colour ſtill fainter.

Theſe coloured ſtreaks he obſerved to lie parallel to the ſhadow of the opaque body; but when it was of an angular form, they did not make the ſame acute angles, but were bent into a curve, the outermoſt being rounder than thoſe that were next the ſhadow, as is repreſented in fig. 10. If it was an inward angle, as DCH, the coloured ſtreaks, parallel to each other of the two ſides croſſed without obliterating one another; only the colours were thereby rendered either more intenſe or mixed.

The light that formed theſe coloured ſtreaks, the reader will perceive, muſt have been bent from the body; but this attentive obſerver has likewiſe given an account of other appearances, which muſt have been produced by the light bending towards the body. For within the ſhadow itſelf he ſometimes perceived coloured ſtreaks, ſimilar to thoſe above mentioned on the outſide of the ſhadow. Sometimes he ſaw more of them, and ſometimes fewer; but for this purpoſe a very ſtrong light was requiſite, and the opaque body was obliged to be long, and of a moderate breadth; which, he ſays, is eaſily found by experience. A hair, for inſtance, or a fine needle, did not anſwer ſo well as a thin and narrow plate: and the ſtreaks were moſt diſtinguiſhable when the ſhadow was taken at the greateſt diſtance; but then the light grew fainter in the ſame proportion.

The number of theſe ſtreaks within the ſhadow was greater in proportion to the breadth of the plate. They were at leaſt two, and ſometimes four, if a thicker rod were made uſe of. But, with the ſame plate or rod, more or fewer ſtreaks appeared, in proportion to the diſtance at which the ſhadow was received; but they were broader when they were few, and narrower when there were more of them; and they were all much more diſtinct when the paper was held obliquely.

Theſe coloured ſtreaks within the ſhadow, like thoſe on the outſide of it, were bent in an arch, round the acute angles of the ſhadow, as they are repreſented in fig. 11. At this angle alſo, as at D, other ſhorter lucid ſtreaks were viſible, bent in the form of a plume, as they are drawn betwixt D and C, each bending round and meeting again in D. Theſe angular ſtreaks appeared, though the plate or rod was not wholly immerſed in the beam of light, but the angle of it only; and there were more or fewer in number in proportion to the breadth of the rod or plate. If the plate or rod was very thin, the coloured ſtreaks within the ſhadow might be ſeen to bend round from the oppoſite ſides, and meet one another as at B. A only repreſents a ſection of the figure, and not a proper termination of the ſhadow, and the ſtreaks within each ſide of it. The coloured ſtreaks without the ſhadow, he alſo obſerves, bend round it in the ſame manner.

Our author acknowledges, that he omits ſeveral obſervations of leſs conſequence, which cannot but occur to any perſon who ſhall make the experiment: and he ſays, that he was not able to give a perfectly clear idea of what he has attempted to deſcribe, nor does he think it in the power of words to do it.

Plate CCCLII.

In order to obtain the more ſatisfactory proof that rays of light do not always proceed in ſtraight lines, but really bend, in paſſing by the edges of bodies, he diverſified the firſt of the above-mentioned experiments in the following manner. He admitted a beam of light, by a very ſmall aperture, into a darkened room, as before; and, at a great diſtance from it, he fixed a plate EF, fig. 12. with a ſmall aperture, GH, which admitted only a part of the beam of light, and found, that when the light tranſmitted through this plate was received at ſome diſtance upon a white paper, the baſe IK was conſiderably larger than it could poſſibly have been made by rays iſſuing in right lines through the two apertures, as the other ſtraight lines drawn cloſe to their edges plainly demonſtrate.

That thoſe who chooſe to repeat theſe experiments may not be diſappointed in their expectations from them, our author gives the following more particular inſtructions. The ſun's light muſt be very intenſe, and the apertures through which it is tranſmitted very narrow, particularly the firſt, CD, and the white paper, IK, on which it is received, muſt be at a conſiderable diſtance from the hole GH; otherwiſe it will not much exceed NO, which would be the breadth of the beam of light proceeding in ſtraight lines. He generally made the aperture CD $\frac{4}{100}$ or $\frac{5}{100}$ part of an ancient Roman foot, and the ſecond aperture, GH, $\frac{25}{100}$ or $\frac{30}{100}$; and the diſtances DG and GN, were, at leaſt, 12 ſuch feet. The obſervation was made in the ſummer time, when the atmoſphere was free from all vapours, and about mid-day.

F. Grimaldi alſo made the ſame experiment that has been recited from Dr Hooke, in which two beams of light, entering a darkened room by two ſmall apertures near to one another, projected cones of light, which, at a certain diſtance, in part coincided; and he particularly obſerved that the dark boundaries of each of them were viſible within the lucid ground of the other.

50 Obſervation of Dechales.

To theſe diſcoveries of Grimaldi, we ſhall ſubjoin an additional obſervation of Dechales; who took notice, that if ſmall ſcratches be made in any piece of poliſhed metal, and it be expoſed to the beams of the ſun in a darkened room, it will reflect the rays ſtreaked with colours in the direction of the ſcratches; as will appear if the reflected light be received upon a piece of white paper. That theſe colours are not produced by refraction, he ſays, is manifeſt; for that, if the ſcratches be made upon glaſs, the effect will be the ſame; and in this caſe, if the light had been refracted at the ſurface of the glaſs, it would have been tranſmitted through it. From theſe, and many other obſervations, he concludes that colour does not depend upon the refraction of light only, nor upon a variety of other circumſtances, which he particularly enumerates, and the effects of which he diſcuſſes, but upon the intenſity of the light only.

51 Of M. de la Hire.

We ſhall here give an account of a phenomenon of viſion obſerved by M. de la Hire, becauſe the ſubject of this ſection, viz. the *inflection of light*, ſeems to ſupply the true ſolution of it, though the author himſelf thought otherwiſe. It is obſervable, he ſays, that when we look at a candle, or any luminous body, with our eyes nearly ſhut, rays of light are extended from it, in ſeveral directions, to a conſiderable diſtance, like the tails of comets. This appearance exerciſed the ſagacity of Deſcartes and Rohault, as well as of our author; but all three ſeem to have been miſtaken with reſpect to it. Deſcartes aſcribed this effect to certain wrinkles in the ſurface of the humours of the eye. Rohault ſays, that when the eye-lids are nearly cloſed, the edges of them act like convex lenſes. But our author ſays, that the moiſture on the ſurface of the eye, adhering partly to the eye itſelf, and partly to the edge of the eye-lid, makes a concave mirror, and ſo diſperſes the rays at their entrance into the eye. But the true reaſon ſeems to be, that the light paſſing among the eye-laſhes, in this ſituation of the eye, is inflected by its near approach to them, and therefore enters the eye in a great variety of directions. The two former of theſe opinions are particularly ſtated and objected to by our author.

52 Sir Iſaac Newton's diſcoveries.

The experiments of Father Grimaldi and Dr Hooke were not only repeated with the greateſt care by Sir Iſaac Newton, but carried much farther than they had thought of. So little uſe had been made of Grimaldi's obſervation, that all philoſophers before Newton had aſcribed the broad ſhadows, and even the fringes of light which he deſcribed, to the ordinary refraction of the air: but we ſhall ſee them placed in a very different point of view by our author.

Plate CCCLIII.

He made in a piece of lead a ſmall hole with a pin, the breadth of which was the 42d part of an inch. Through this hole he let into his darkened chamber a beam of the ſun's light; and found, that the ſhadows of hairs, and other ſlender ſubſtances placed in it, were conſiderably broader than they would have been if the rays of light had paſſed by thoſe bodies in right lines. He therefore concluded, that they muſt have paſſed as they are repreſented in fig. 1. in which X repreſents a ſection of the hair, and AD, BE, &c. rays of light paſſing by at different diſtances, and then falling upon the wall GQ. Since, when the paper which receives the rays is at a great diſtance from the hair, the ſhadow is broad, it muſt follow, as he obſerves, that the hair acts upon the rays of light at ſome conſiderable diſtance from it, the action being ſtrongeſt on thoſe rays which are at the leaſt diſtance, and growing weaker and weaker on thoſe which are farther off, as is repreſented in this figure; and from hence it comes to paſs that the ſhadow of the hair is much broader in proportion to the diſtance of the paper from the hair when it is nearer than when it is at a great diſtance.

He found, that it was not material whether the hair was ſurrounded with air, or with any other pellucid ſubſtance; for he wetted a poliſhed plate of glaſs, and laid the hair in the water upon the glaſs, and then laying another poliſhed plate of glaſs upon it, ſo that the water might fill up the ſpace between the glaſſes, and holding them in the beam of light, he found the ſhadow at the ſame diſtances was as big as before. Alſo the ſhadows of ſcratches made in poliſhed plates of glaſs, and the veins in the glaſs, caſt the like broad ſhadows: ſo that this breadth of ſhadow muſt proceed from ſome other cauſe than the refraction of the air.

The ſhadows of all bodies, metals, ſtones, glaſs, wood, horn, ice, &c. in this light were bordered with three parallel fringes, or bands of coloured light, of which that which was contiguous to the ſhadow was the broadeſt and moſt luminous, while that which was the moſt remote was the narroweſt, and ſo faint as not eaſily to be viſible. It was difficult to diſtinguiſh theſe colours, unleſs when the light fell very obliquely upon a ſmooth paper, or ſome other ſmooth white body, ſo as to make them appear much broader than they would otherwiſe have done; but in theſe circumſtances the colours were plainly viſible, and in the following order. The firſt or innermoſt fringe was violet, and deep blue next the ſhadow, light blue, green, and yellow in the middle, and red without. The ſecond fringe was almoſt contiguous to the firſt, and the third to the ſecond; and both were blue within, and yellow and red without; but their colours were very faint, eſpecially thoſe of the third. The colours, therefore, proceeded in the following order from the ſhadow; violet, indigo, pale blue, green, yellow, red; blue, yellow, red; pale blue, pale yellow, and red. The ſhadows, made by ſcratches and bubbles in poliſhed plates of glaſs were bordered with the like fringes of coloured light.

He alſo obſerves, that by looking on the ſun through a feather, or black ribbon, held cloſe to the eye, ſeveral rainbows will appear, the ſhadows which the fibres or threads caſt on the retina being bordered with the like fringes of colours.

Meaſuring theſe fringes and their intervals with the greateſt accuracy, he found the former to be in the progreſſion of the numbers 1, $\surd\frac{1}{3}$, $\surd\frac{1}{5}$, and their intervals to be in the ſame progreſſion with them, that is, the fringes and their intervals together to be in continual progreſſion of the numbers 1, $\surd\frac{1}{2}$, $\surd\frac{1}{3}$, $\surd\frac{1}{4}$, $\surd\frac{1}{5}$, or thereabouts. And theſe proportions held the ſame very nearly at all diſtances from the hair, the dark intervals of the fringes being as broad in proportion to the breadth of the fringes at their firſt appearance as afterwards, at great diſtances from the hair, though not ſo dark and diſtinct.

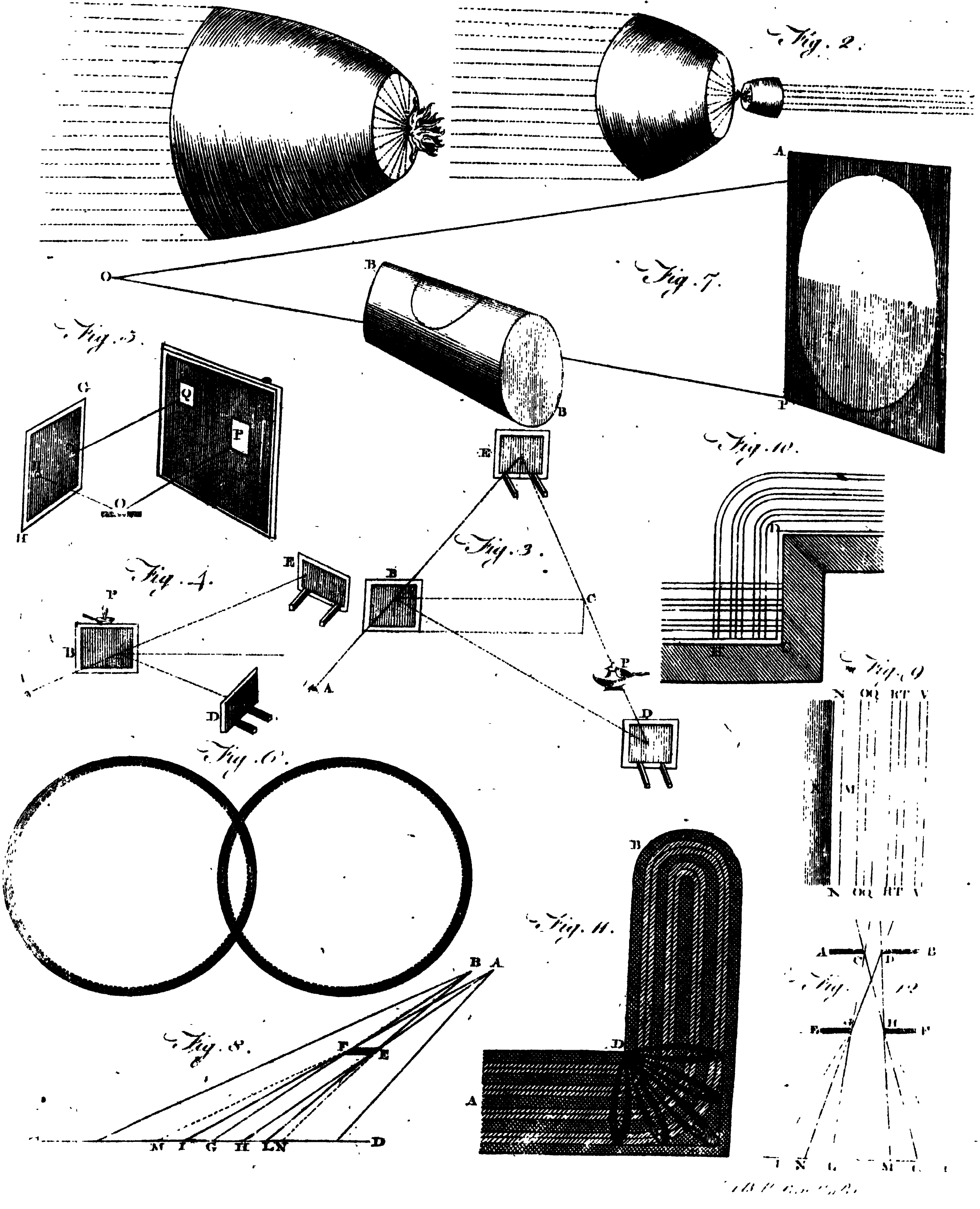
In the next obſervation of our author, we find a very remarkable and curious appearance, which we ſhould hardly have expected from the circumſtances, though it is pretty ſimilar to one that was noticed by Dr Hooke. The ſun ſhining into his darkened chamber, through a hole ¾ of an inch broad, he placed, at the diſtance of two or three feet from the hole, a ſheet of paſteboard, black on both ſides; and in the middle of it he had made a hole about ¼ of an inch ſquare, for the light to paſs through; and behind the hole he faſtened to the paſteboard the blade of a ſharp knife, to intercept ſome part of the light which paſſed through the hole. The planes of the paſteboard and blade of the knife were parallel to one another, and perpendicular to the rays; and when they were ſo placed that none of the light fell on the paſteboard, but all of it paſſed through the hole to the knife, and there part of it fell upon the blade of the knife, and part of it paſſed by its edge, he let that part of the light which paſſed by fall on a white paper, 2 or 3 feet beyond the knife, and there ſaw two ſtreams of faint light ſhoot out both ways from the beam of light into the ſhadow, like the tails of comets. But becauſe the ſun's direct light, by its brightneſs upon the paper, obſcured theſe faint ſtreams, ſo that he could ſcarce ſee them, he made a little hole in the midſt of the paper for that light to paſs through and fall on a black cloth behind it; and then he ſaw the two ſtreams plainly. They were like one another, and pretty nearly equal in length, breadth, and quantity of light. Their light, at that end which was next to the ſun's direct light, was pretty ſtrong for the ſpace of about ¼ of an inch, or ½ of an inch, and decreaſed gradually till it became inſenſible.

The whole length of either of theſe ſtreams, meaſured upon the paper, at the diſtance of 3 feet from the knife, was about 6 or 8 inches; ſo that it ſubtended an angle, at the edge of the knife, of about 10 or 12, or at moſt 14, degrees. Yet ſometimes he thought he ſaw it ſhoot 3 or 4 degrees farther; but with a light ſo very faint, that he could hardly perceive it. This light he ſuſpected might, in part at leaſt, ariſe from ſome other cauſe than the two ſtreams. For, placing his eye in that light, beyond the end of that ſtream which was behind the knife, and looking towards the knife, he could ſee a line of light upon its edge; and that not only when his eye was in the line of the ſtreams, but alſo when it was out of that line, either towards the point of the knife, or towards the handle. This line of light appeared contiguous to the edge of the knife, and was narrower than the light of the innermoſt fringe, and narroweſt when his eye was fartheſt from the direct light; and therefore ſeemed to paſs between the light of that fringe and the edge of the knife; and that which paſſed neareſt the edge ſeemed to be moſt bent, though not all of it.

He then placed another knife by the former, ſo that their edges might be parallel, and look towards one another, and that the beam of light might fall upon both the knives, and ſome part of it paſs between their edges. In this ſituation he obſerved, that when the diſtance of their edges was about the 400th part of an inch, the ſtream divided in the middle, and left a ſhadow between the two parts. This ſhadow was ſo black and dark, that all the light which paſſed between the knives ſeemed to be bent and turned aſide to the one hand or the other; and as the knives ſtill approached one another, the ſhadow grew broader and the ſtreams ſhorter next to it, till, upon the contact of the knives, all the light vaniſhed.

From this experiment our author concludes, that the light which is leaſt bent, and which goes to the inward ends of the ſtreams, paſſes by the edges of the knives at the greateſt diſtance; and this diſtance, when the ſhadow began to appear between the ſtreams, was about the 800th part of an inch; and the light which paſſed by the edges of the knives at diſtances ſtill leſs

OPTICS. **Plate CCCLII.**



and leſs, was more and more faint, and went to thoſe parts of the ſtreams which were farther from the direct light; becauſe, when the knives approached one another till they touched, thoſe parts of the ſtreams vaniſhed laſt which were fartheſt from the direct light.

In the experiment of one knife only, the coloured fringes did not appear; but, on account of the breadth of the hole in the window, became ſo broad as to run into one another, and, by joining, to make one continual light in the beginning of the ſtreams; but in the laſt experiment, as the knives approached one another, a little before the ſhadow appeared between the two ſtreams, the fringes began to appear on the inner ends of the ſtreams, on either ſide of the direct light; three on one ſide, made by the edge of one knife, and three on the other ſide, made by the edge of the other knife. They were the moſt diſtinct when the knives were placed at the greateſt diſtance from the hole in the window, and became ſtill more diſtinct by making the hole leſs; ſo that he could ſometimes ſee a faint trace of a fourth fringe beyond the three above mentioned: and as the knives approached one another the fringes grew more diſtinct and larger, till they vaniſhed; the outermoſt vaniſhing firſt, and the innermoſt laſt. After they were all vaniſhed, and the line of light which was in the middle between them was grown very broad, extending itſelf on both ſides into the ſtreams of light deſcribed before, the above-mentioned ſhadow began to appear in the middle of this line, and to divide it along the middle into two lines of light, and increaſed till all the light vaniſhed. This enlargement of the fringes was ſo great, that the rays which went to the innermoſt fringe ſeemed to be bent about 20 times more when the fringe was ready to vaniſh, than when one of the knives was taken away.

From both theſe experiments compared together, our author concluded, that the light of the firſt fringe paſſed by the edge of the knife at a diſtance greater than the 800th part of an inch; that the light of the ſecond fringe paſſed by the edge of the knife at a greater diſtance than the light of the firſt fringe, and that of the third at a greater diſtance than that of the ſecond; and that the light of which the ſtreams above mentioned conſiſted, paſſed by the edges of the knives at leſs diſtances than that of any of the fringes.

He then got the edges of two knives ground truly ſtraight, and pricking their points into a board, ſo that their edges might look towards one another, and meeting near their points, contain a rectilinear angle, he faſtened their handles together, to make the angle invariable. The diſtance of the edges of the knives from one another, at the diſtance of four inches from the angular point, where the edges of the knives met, was the 8th part of an inch; ſo that the angle contained by their edges was about 1° 54′. The knives being thus fixed together, he placed them in a beam of the ſun's light let into his darkened chamber, through a hole the 42d part of an inch wide, at the diſtance of 10 or 13 feet from the hole; and he let the light which paſſed between their edges fall very obliquely on a ſmooth white ruler, at the diſtance of ½ inch, or an inch, from the knives; and there he ſaw the fringes made by the two edges of the knives run along the edges of the ſhadows of the knives, in lines parallel to thoſe edges, without growing ſenſibly broader, till they met in angles equal to the angle contained by the edges of the knives; and where they met and joined, they ended, without croſſing one another. But if the ruler was held at a much greater diſtance from the knives, the fringes, where they were farther from the place of their meeting, were a little narrower, and they became ſomething broader as they approached nearer to one another, and after they met they croſſed one another, and then became much broader than before.

From theſe obſervations he concluded, that the diſtances at which the light compoſing the fringes paſſed by the knives were not increaſed or altered by the approach of the knives, but that the angles in which the rays were there bent were much increaſed by that approach; and that the knife which was neareſt to any ray determined which way the ray ſhould be bent, but that the other knife increaſed the bending.

When the rays fell very obliquely upon the ruler, at the diſtance of a third part of an inch from the knives, the dark line between the firſt and ſecond fringe of the ſhadow of one knife, and the dark line between the firſt and ſecond fringe of the ſhadow of the other knife, met one another, at the diſtance of the fifth part of an inch from the end of the light which paſſed between the knives, where their edges met one another; ſo that the diſtance of the edges of the knives, at the meeting of the dark lines, was the 160th part of an inch; and one half of that light paſſed by the edge of one knife, at a diſtance not greater than the 320th part of an inch, and, falling upon the paper, made the fringes of the ſhadow of that knife; while the other half paſſed by the edge of the other knife, at a diſtance not greater than the 320th part of an inch, and, falling upon the paper, made the fringes of the ſhadow of the other knife. But if the paper was held at a diſtance from the knives greater than the third part of an inch, the dark lines above mentioned met at a greater diſtance than the fifth part of an inch from the end of the light which paſſed between the knives, at the meeting of their edges; ſo that the light which fell upon the paper where thoſe dark lines met paſſed between the knives, where their edges were farther diſtant than the 160th part of an inch. For at another time, when the two knives were 8 feet and 5 inches from the little hole in the window, the light which fell upon the paper where the above-mentioned dark lines met paſſed between the knives, where the diſtance between their edges was, as in the following table, at the diſtances from the paper there noted.

Diſtances of the paper from the knives in inches.	Diſtance between the edges of the knives in milleſimal parts of an inch.
	0,012
	0,020
8	0,034
32	0,057
96	0,081
131	0,087

From theſe obſervations he concluded, that the light which makes the fringes upon the paper is not the ſame light at all diſtances of the paper from the knives; but that when the paper is held near the knives, the fringes are made by light which paſſes by the edges of the knives at a leſs diſtance, and is more bent than when the paper is held at a greater diſtance from the knives.

Plate CCCLIII. fig. 2.

When the fringes of the ſhadows of the knives fell perpendicularly upon the paper, at a great diſtance from the knives, they were in the form of hyperbolas, their dimenſions being as follow. Let CA, CB, repreſent lines drawn upon the paper, parallel to the edges of the knives; and between which all the light would fall if it ſuffered no inflection. DE is a right line drawn through C, making the angles ACD, BCE, equal to one another, and terminating all the light which falls upon the paper, from the point where the edges of the knives meet. Then *e i s*, *f k t*, and *g l v*, will be three hyperbolical lines, repreſenting the boundaries of the ſhadow of one of the knives, the dark line between the firſt and ſecond fringes of that ſhadow, and the dark line between the ſecond and third fringes of the ſame ſhadow. Alſo *x i p*, *y k q*, and *z l r*, will be three other hyperbolical lines, repreſenting the boundaries of the ſhadow of the other knife, the dark line between the firſt and ſecond fringes of that ſhadow, and the dark line between the ſecond and third fringes of the ſame ſhadow. Theſe three hyperbolas are ſimilar, and equal to the former three, and croſs them in the points *i*, *k*, and *l*; ſo that the ſhadows of the knives are terminated, and diſtinguiſhed from the firſt luminous fringes, by the lines *e i s* and *x i p*, till the meeting and croſſing of the fringes; and then thoſe lines croſs the fringes in the form of dark lines terminating the firſt luminous fringes on the inſide, and diſtinguiſhing them from another light, which begins to appear at *i*, and illuminates all the triangular ſpace *i p* DE*s*, comprehended by theſe dark lines and the right line DE. Of theſe hyperbolas one aſymptote is the line DE, and the other aſymptotes are parallel to the lines CA and CB.

The ſun ſhining into his darkened room through the ſmall hole mentioned above, he placed at the hole a priſm to refract the light, and to form on the oppoſite wall the coloured image of the ſun; and he found that the ſhadows of all bodies held in the coloured light between the priſm and the wall, were bordered with fringes of the colour of that light in which they were held; and comparing the fringes made in the ſeveral coloured lights, he found that thoſe made in the red light were the largeſt, thoſe made in the violet were the leaſt, and thoſe made in the green were of a middle bigneſs. For the fringes with which the ſhadow of a man's hair were bordered, being meaſured croſs the ſhadow, at the diſtance of ſix inches from the hair, the diſtance between the middle and moſt luminous part of the firſt or innermoſt fringe on one ſide of the ſhadow, and that of the like fringe on the other ſide of the ſhadow, was, in the full red light $\frac{1}{37\frac{1}{4}}$ of an inch, and in the full violet $\frac{1}{37}$. The like diſtance between the middle and moſt luminous parts of the ſecond fringes, on either ſide of the ſhadow, was in the full red light $\frac{1}{22}$ and the violet $\frac{1}{27}$ of an inch; and theſe diſtances of the fringes held the ſame proportion at all diſtances from the hair, without any ſenſible variation.

From theſe obſervations it was evident, that the rays which made the fringes in the red light, paſſed by the hair at a greater diſtance than thoſe which made the like fringes in the violet; ſo that the hair, in cauſing theſe fringes, acted alike upon the red light or leaſt refrangible rays at a greater diſtance, and upon the violet or moſt refrangible rays at a leſs diſtance; and thereby occaſioned fringes of different ſizes, without any change in the colour of any ſort of light.

It may therefore be concluded, that when the hair in the firſt obſervation was held in the white beam of the ſun's light, and caſt a ſhadow which was bordered with three fringes of coloured light, thoſe colours aroſe not from any new modifications impreſſed upon the rays of light by the hair, but only from the various inflections whereby the ſeveral ſorts of rays were ſeparated from one another, which before ſeparation, by the mixture of all their colours, compoſed the white beam of the ſun's light; but, when ſeparated, compoſed lights of the ſeveral colours which they are originally diſpoſed to exhibit.

53 Miraldi's diſcoveries.

The perſon whoſe name we find firſt upon the liſt of thoſe who purſued any experiments ſimilar to thoſe of Newton on inflected light is M. Miraldi; whoſe obſervations chiefly reſpect the inflection of light towards other bodies, whereby their ſhadows are partially illuminated; and many of the circumſtances which he noticed relating to it are well worthy of our attention, as the reader will be convinced from the following account of them.

54 Experiments concerning the ſhadows of cylinders.

He expoſed in the light of the ſun a cylinder of wood three feet long, and 6½ lines in diameter; when its ſhadow, being received upon a paper held cloſe to it, was everywhere equally black and well defined, and continued to be ſo to the diſtance of 23 inches from it. At a greater diſtance the ſhadow appeared to be of two different denſities; for the two extremities of the ſhadow, in the direction of the length of the cylinder, were terminated by two dark ſtrokes, a little more than a line in breadth. Within theſe dark lines there was a faint light, equally diſperſed through the ſhadow, which formed an uniform penumbra, much lighter than the dark ſtrokes at the extremity, or than the ſhadow received near the cylinder. This appearance is repreſented in Plate CCCLIII. fig. 3.

As the cylinder was removed to a greater diſtance from the paper, the two black lines continued to be nearly of the ſame breadth, and the ſame degree of obſcurity; but the penumbra in the middle grew lighter, and its breadth diminiſhed, ſo that the two dark lines at the extremity of the ſhadow approached one another, till at the diſtance of 60 inches, they coincided, and the penumbra in the middle entirely vaniſhed. At a ſtill greater diſtance a faint penumbra was viſible; but it was ill defined, and grew broader as the cylinder was removed farther off, but was ſenſible at a very great diſtance.

Beſides the black and dark ſhadow which the cylinder formed near the opaque body, a narrow and faint penumbra was ſeen on the outſide of the dark ſhadow. And on the outſide of this there was a tract more ſtrongly illuminated than the reſt of the paper.

The breadth of the external penumbra increaſed with the diſtance of the ſhadow from the cylinder, and the breadth of the tract of light on the outſide of it was alſo enlarged; but its ſplendour diminiſhed with the diſtance.

He repeated theſe experiments with three other cylinders of different dimenſions: and from them all he inferred, that every opaque cylindrical body, expoſed to the light of the ſun, makes a ſhadow which is black and dark to the diſtance of 38 to 45 diameters of the cylinder which forms it; and that, at a greater diſtance, the middle part begins to be illuminated in the manner deſcribed above.

In explaining theſe appearances, our author ſuppoſes that the light which diluted the middle part of the ſhadow was occaſioned by the infl[illegible] of the [illegible], which, bending inwards on their near approach to the body, did at a certain diſtance enlighten all the ſhadow, except the edges, which were left undiſturbed. At the ſame time other rays were deflected from the body, and formed a ſtrong light on the outſide of the ſhadow, and which might at the ſame time contribute to dilute the outer ſhadow, though he ſuppoſed that penumbra to be occaſioned principally by that part of the paper not being enlightened, except by a part of the ſun's diſk only, according to the known principles of optics.

55
Concerning thoſe of globes.

The ſame experiments he made with globes of ſeveral diameters; but he found, that, whereas the ſhadows of the cylinders did not diſappear but at the diſtance of 41 of their diameters, thoſe of the globes were not viſible beyond 15 of their diameters; which he thought was owing to the light being inflected on every ſide of a globe, and conſequently in ſuch a quantity as to diſperſe the ſhadows ſooner than in the caſe of the cylinders.

In all theſe caſes, the penumbra occaſioned by the inflected light began to be viſible at a leſs diſtance from the body in the ſtronger light of the ſun than in a weaker, on account of the greater quantity of rays inflected in thoſe circumſtances.

56
His miſtake concerning the moon.

Conſidering the analogy between theſe experiments and the phenomena of an eclipſe of the moon, immerſed in the ſhadow of the earth, he imagined, that part of the light by which ſhe is then viſible is inflected light, and not that which is refracted by the atmoſphere; though this may be ſo copious as to efface ſeveral of the above mentioned appearances, occaſioned by inflected light only. But this gentleman ſhould have conſidered, that as no light is inflected but what paſſes exceedingly near to any body, perhaps ſo near as the diſtance of $\frac{1}{40}$ part of an inch, this cauſe muſt be altogether inadequate to the effect.

Being ſenſible that the above-mentioned phenomena of the ſhadows were cauſed by inflected light, he was induced to give more particular attention to this remarkable property; and, in order to it, to repeat the experiments of Grimaldi and Sir Iſaac Newton in a darkened room. In doing this, he preſently obſerved that, beſides the enlarged ſhadow of a hair, a fine needle, &c. the bright gleam of light that bordered it, and the three coloured rings next to this enlightened part, when the ſhadow was at a conſiderable diſtance from the hair, the dark central ſhadow was divided in the middle by a mixture of light; and that it was not of the ſame denſity, except when it was very near the hair.

This new appearance will be ſeen to be exactly ſimilar to what our philoſopher had obſerved with reſpect to the ſhadows in the open day-light above mentioned; but the following obſervations, which he made with ſome variation of his apparatus, are much more curious and ſtriking, though they ariſe from the ſame cauſe.

Having placed a briſtle, which is thicker than a common hair, in the rays of the ſun, admitted into a dark chamber by a ſmall hole, at the diſtance of nine feet from the hole, it made a ſhadow, which, being received at five or ſix feet from the object, he obſerved to conſiſt of ſeveral ſtreaks of light and ſhade. The middle part was a faint ſhadow, or rather a kind of penumbra, bordered by a darker ſhadow, and after that by a narrower penumbra; next to which was a light ſtreak broader than the dark part, and next to the ſtreak of light, the red, violet, and blue colours were ſeen as in the ſhadow of the hair.

In the ſame manner he placed, in the ſame rays of the ſun, ſeveral needles of different ſizes; but the appearances were ſo exceedingly various, though ſufficiently ſingular, that he does not recite them particularly, but chooſes rather to give, at ſome length, the obſervations he made on the ſhadows of two plates, as by that means he could better explain the phenomena of the round bodies.

57
Experiments concerning the ſhadows of [illegible]

He expoſed in the rays of the ſun, admitted by a ſmall hole into a dark chamber, a plate that was two inches long, and a little more than half a line broad. This plate being fixed perpendicularly to the rays, at the diſtance of nine feet from the hole, a faint light was ſeen uniformly diſperſed over the ſhadow, when it was received perpendicularly to it, and very near. The ſhadow of the ſame plate being received at the diſtance of two feet and a half, was divided into four very narrow black ſtreaks, ſeparated by ſmall lighter intervals equal to them. The boundaries of this ſhadow on each ſide had a penumbra, which was terminated by a very ſtrong light, next to which were the coloured ſtreaks of red, violet, and blue, as before. This is repreſented in Plate CCLIII. fig. 4.

The ſhadow of the ſame plate, at $4\frac{1}{2}$ feet diſtance from it, was divided into two black ſtreaks only, the two outermoſt having diſappeared, as in fig. 5.; but theſe two black ſtreaks which remained were broader than before, and ſeparated by a lighter ſhade, twice as broad as one of the former black ſtreaks, when the ſhadow was taken at $2\frac{1}{2}$ feet. This penumbra in the middle had a tinge of red. After the two black ſtreaks there appeared a pretty ſtrong penumbra, terminated by the two ſtreaks of light, which were now broad and ſplendid, after which followed the coloured ſtreaks.

A ſecond plate, two inches long and a line broad, being placed like the former, 14 feet from the hole by which the rays of the ſun were admitted, its ſhadow being received perpendicularly very near the plate, was illuminated by a faint light, equally diſperſed, as in the caſe of the preceding plate. But being received at the diſtance of 13 feet from the plate, ſix ſmall black

Plate CCCLIII.

ſtreaks began to be viſible, as in fig. 6. At 17 feet from the plate, the black ſtreaks were broader, more diſtinct, and more ſeparated from the ſtreaks that were leſs dark. At 42 feet from the plate, only two black ſtreaks were ſeen in the middle of the penumbra, as in fig. 7. This middle penumbra between the two black ſtreaks was tinged with red. Next to the black ſtreaks there always appeared the ſtreaks of light, which were broad, and the coloured ſtreaks next to them.

Receiving the ſhadow of the ſame plate at the diſtance of 72 feet, the appearances were the ſame as in the former ſituation, except that the two black ſtreaks were broader, and the interval between them, occupied by the penumbra, was broader alſo, and tinged with a deeper red.

In the ſame rays of the ſun he placed different plates, and larger than the former, one of them a line and a half, another two lines, another three lines broad, &c. but receiving their ſhadows upon paper, he could not perceive in them thoſe ſtreaks of faint light which he had obſerved in the ſhadows of the ſmall plates, though he received theſe ſhadows at the diſtance of 56 feet. Nothing was ſeen but a weak light, equally diffuſed, as in the ſhadows of the two ſmalleſt plates, received very near them. But had his dark chamber been large enough, he did not doubt, but that, at a proper diſtance, there would have been the ſame appearances in the ſhadows of the larger plates as in thoſe of the ſmalleſt. For the ſame reaſon, he ſuppoſed, that, if the ſhadows of the ſmall needles could have been diſtinctly viewed very near thoſe bodies, the different ſtreaks of light and ſhade would have been as viſible in them as in thoſe of the ſmall plates; and indeed he did obſerve the ſame appearances in the ſhadows of needles of a middling ſize.

The ſtreaks of light in theſe ſhadows our author aſcribed to the rays of light which are inflected at different diſtances from the bodies; and he imagined that their croſſing one another was ſufficient to account for the variations obſervable in them at different diſtances.

The extraordinary ſize of the ſhadows of theſe ſmall ſubſtances M. Miraldi thought to be occaſioned by the ſhadow from the enlightened part of the ſky, added to that which was made by the light of the ſun, and alſo to a vortex occaſioned by the circulation of the inflected light behind the object; but our readers will probably not think it neceſſary for us either to produce all his reaſons for this hypotheſis, or to enter into a refutation of them.

Our author having made the preceding experiments upon ſingle long ſubſtances, had the curioſity to place two of them ſo as to croſs one another in a beam of the ſun's light. The ſhadows of two hairs placed in this manner, and received at ſome diſtance from them, appeared to be painted reciprocally one upon the other, ſo that the obſcure part of one of them was viſible upon the obſcure part of the other. The ſtreaks of light alſo croſſed one another, and the coloured ſtreaks did the ſame.

Having placed a needle and a hair croſſing one another, their ſhadows, at the ſame diſtance, exhibited the ſame appearances as the ſhadows of the two hairs, though the ſhadow of the needle was the ſtronger.

He alſo placed in the rays of the ſun a briſtle and a plate of iron a line thick, ſo that they croſſed one another obliquely; and when their ſhadows were received at the ſame diſtance, the light and dark ſtreaks of the ſhadow of the briſtle were viſible ſo far as the middle of the ſhadow of the plate on the ſide of the acute angle, but not on the ſide of the obtuſe angle, whether the briſtle or the plate were placed next to the rays. The plate made a ſhadow ſufficiently dark, divided into ſix black ſtreaks; and theſe were again divided by as many light ones equal to them; and yet all the ſtreaks belonging to the ſhadow of the briſtle were viſible upon it, as in fig. 8. To explain this appearance, he ſuppoſed that the rays of the ſun glided a little along the briſtle, ſo as to enlighten part of that which was behind the plate. But this ſeems to be an arbitrary and improbable ſuppoſition.

Our philoſopher did not fail to expoſe ſeveral ſmall globes in the light of the ſun in his dark chamber, and to compare their ſhadows with thoſe of the long ſubſtances, as he had done in the day light, and the appearances were ſtill ſimilar. It was particularly evident, that there was much more light in the ſhadows of the globes than in thoſe of the cylinders, not only when they were both of an equal diameter, but when that of the globe was larger than that of the cylinder, and the ſhadows of both the bodies were received at the ſame diſtance. He alſo obſerved, that he could perceive no difference of light in the ſhadows of the plates which were a little more than one line broad, though they were received at the diſtance of 72 feet; but he could eaſily ſee a difference of ſhades in thoſe of the globes, taken at the ſame diſtance, though they were $2\frac{1}{2}$ lines in diameter.

In order to explain the colours at the edges of theſe ſhadows, he contrived to throw ſome of the ſhadows upon others; and the following obſervations, though they did not enable him to accompliſh what he intended, are curious and worth reciting.

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Experiments with a mixture of coloured ſhadows.

Having thrown ſeveral of the ſimilar colours upon one another, and thereby produced a tinge more lively than before, he threw the gleam of light, which always intervened between the colours and the darker part of the ſhadow, upon different parts of other ſhadows; and obſerved, that, when it fell upon the exterior penumbra made by another needle, it produced a beautiful ſky blue colour, almoſt like that which was produced by two blue colours thrown together. When the ſame gleam of light fell upon the deeper ſhadow in the middle, it produced a red colour; which ſeemed to prove, that the reddiſh colour in the middle of ſeveral of the ſhadows might come from the little light inflected into that place. But here our author ſeems to have been miſled by ſome falſe hypotheſis concerning colours.

He placed two plates of iron, each three or four lines broad, very near one another, but with a very ſmall interval between them: and having placed them in the rays of the ſun, and received their ſhadows at the diſtance of 15 or 20 feet from them, he ſaw no light between them but a continued ſhadow, in the middle of which were ſome ſtreaks of a lively purple, parallel to one another, and ſeparated by other black ſtreaks; but between them there were other ſtreaks, both of a very faint green, and alſo of a pale yellow.—He alſo informs us, that M. Deliſle had obſerved colours in the ſtreaks of light and ſhade, which are obſervable in ſhadows taken near the bodies.

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M. Mairan's obſervations.

Among thoſe who followed Sir Iſaac Newton in his obſervations on the inflection of light, we alſo find the ingenious M. Mairan: but, without attempting the diſcovery of new facts, he only endeavoured to explain the old ones, by the hypotheſis of an atmoſphere ſurrounding all bodies; and conſequently making two reflections and refractions of the light that impinges upon them, one at the ſurface of the atmoſphere, and the other at that of the body itſelf. This atmoſphere he ſuppoſed to be of a variable denſity and refractive power, like the air.

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Diſcoveries of M. Du Tour.

M. Mairan was ſucceeded by M. Du Tour, who thought the variable atmoſphere ſuperfluous, and imagined that he could account for all the phenomena by the help of an atmoſphere of an uniform denſity, and of a leſs refractive power than the air ſurrounding all bodies. But what we are moſt obliged to this gentleman for, is, not his ingenious *hypotheſis*, but the beautiful variety with which he has exhibited the *experiments*, which will render it much eaſier for any perſon to inveſtigate the true cauſes of them.

Before M. Du Tour gave his attention to this ſubject, only three fringes had been obſerved in the colours produced by the inflection of light; but he was accidentally led to obſerve a greater number of them, and adopted from Grimaldi the following ingenious method of making them all appear very diſtinct.

Plate CCCLIII.

He took a circular board ABED (fig. 9.), 13 inches in diameter, the ſurface of which was black, except at the edge, where there was a ring of white paper about three lines broad, in order to trace the circumference of a circle, divided into 360 degrees, beginning at the point A, and reckoning 180 degrees on each hand to the point E; B and D being each of them placed at 90 degrees. A ſlip of parchment three inches broad, and diſpoſed in the form of a hoop, was faſtened round the board, and pierced at the point E with a ſquare hole, each ſide being four or five lines, in order to introduce a ray of the ſun's light. Laſtly, In the centre of the board C, and perpendicular to it, he fixed a pin about $\frac{1}{4}$ of a line in diameter.

This hoop being ſo diſpoſed, that a ray of light entering the dark chamber, through a vertical cleft of two lines and a half in length, and about as wide as the diameter of the pin, went through the hole at E, and paſſing parallel to the plane of the board, projected the image of the ſun and the ſhadow of the pin at A. In theſe circumſtances he obſerved,

1. That quite round the concave ſurface of this hoop, there were a multitude of coloured ſtreaks; but that the ſpace *m*A*n*, of about 18 degrees, the middle of which was occupied by the image of the ſun, was covered with a faint light only.

2. The order of the colours in theſe ſtreaks was generally ſuch that the moſt refrangible rays were the neareſt to the incident ray ECA; ſo that, beginning from the point A, the violet was the firſt and the red the laſt colour in each of the ſtreaks. In ſome of them, however, the colours were diſpoſed in a contrary order.

3. The image of the ſun, projected on each ſide of the point A, was divided by the ſhadow of the pin, which was bordered by two luminous ſtreaks.

4. The coloured ſtreaks were narrower in ſome parts of the hoop than others, and generally decreaſed in breadth in receding from the point A.

5. Among theſe coloured ſtreaks, there were ſometimes others which were white, a line or a line and a half in breadth, which were always bordered on both ſides by a ſtreak of orange colour, at leaſt when the light of the ſun was intenſe, and the chamber ſufficiently dark.

From this experiment he thought it was evident, that the rays which paſſed beyond the pin were not the only ones that were decompoſed, for that thoſe which were reflected back from the pin were decompoſed alſo; from which he concluded that they muſt have undergone ſome refraction. He alſo thought that thoſe which went beyond the pin ſuffered a reflection, ſo that they were all affected in a ſimilar manner.

In order to account for theſe facts our author deſcribes the progreſs of a ray of light through an uniform atmoſphere, which he ſuppoſes to ſurround the pin; and ſhows, that the differently refrangible rays will be ſeparated at their emergence from it: but he refers to ſome experiments and obſervations in a future memoir, to demonſtrate that all the coloured ſtreaks are produced by rays that are both reflected and refracted.

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Account of Du Tour's hypotheſis.

To give ſome idea of his hypotheſis, he ſhows that the ray *a b*, fig. 10. after being refracted at *b*, reflected at *r* and *u*, and again refracted at *s* and *t*, will be divided into its proper colours; the leaſt refrangible or the red rays iſſuing at *x*, and the moſt refrangible or violet at *y*; which agrees with his obſervations. Thoſe ſtreaks in which the colours appear in a contrary order he thinks are to be aſcribed to inequalities in the ſurface of the pin. This might eaſily have been aſcertained by turning the pin round; in which caſe theſe differently coloured ſtreaks would have changed their places.

If any perſon ſhould chooſe to repeat theſe experiments, he obſerves that it requires that the ſky be very clear and free from vapours, in order to exhibit the colours with the greateſt diſtinctneſs; ſince even the vapours that are imperceptible will diminiſh the luſtre of the colours on every part of the hoop, and even efface ſome of them, eſpecially thoſe which are on that part in which the beam of light enters, as at E, fig. 9. where the colours are always fainter than in any other place, and indeed can never be diſtinguiſhed except when the hole E is confined by black ſubſtances, ſo as to intercept a part of the light that might reach the pin; and unleſs alſo thoſe rays which go beyond the pin to form the image of the ſun at A be ſtopped, ſo that no rays are viſible except thoſe that are reflected towards the hole, and which make the faint ſtreaks.

The coloured ſtreaks that are next the ſhadow of the pin, he ſhows, are formed by thoſe rays which, entering the atmoſphere, do not fall upon the pin; and, without any reflection, are only refracted at their entering

Plate CCCLIII.

entering and leaving the atmoſphere, as at *b* and *r u*, fig. 11. In this caſe, the red or leaſt refrangible rays will iſſue at *r*, and the violet at *u*.

To diſtinguiſh the rays which fell upon the hoop in any particular direction, from thoſe that came in any other, he made an opening in the hoop, as at P, fig. 9. by which means he could, with advantage, and at any diſtance from the centre, obſerve thoſe rays unmixed with any other.

To account for the coloured ſtreaks being larger next the ſhadow of the pin, and growing narrower to the place where the light was admitted, he ſhows, by fig. 12. that the rays *a b* are farther ſeparated by both the refractions than the rays *c d*.

Sometimes our author obſerved, that the broader ſtreaks were not diſpoſed in this regular order; but then he found, that by turning the pin they changed their places, ſo that this circumſtance muſt have been an irregularity depending upon the accidental ſurface of the pin.

The white ſtreaks intermixed with the coloured ones he aſcribes to ſmall cavities in the ſurface of the pin, or ſome other foreign circumſtance; for they alſo changed their places when the pin was made to turn upon its axis.

Other obſervations of our author ſeem to prove that the refracting atmoſpheres ſurrounding all kinds of bodies are of the ſame ſize; for when he placed a great variety of ſubſtances, and of different ſizes alſo, he always found the coloured ſtreaks of the ſame dimenſions.

M. Du Tour obſerves that his hypotheſis contradicts an obſervation of Sir Iſaac Newton, that thoſe rays which paſs the neareſt to any body are the moſt inflected; but he thinks that Newton's obſervations were not ſufficiently accurate. Beſides, he obſerves, that Newton only ſaid that *he thought it to be ſo*, without aſſerting it poſitively.

Since the rays which formed theſe coloured ſtreaks are but little diverted out of their way, our author infers that this atmoſphere is of ſmall extent, and that its refractive power is not much leſs than that of air.

Expoſing two pieces of paper in the beam of light, ſo that part of it paſſed between two planes formed by them, M. Du Tour obſerved, that the edges of this light, received upon paper, were bordered with two orange-coloured ſtreaks, which Newton had not taken notice of in any of his experiments. To account for them, he ſuppoſes, that, in fig. 13. the more refrangible of the rays which enter at *b* are ſo refracted, that they do not reach the ſurface of the body itſelf at R: ſo that the red and orange-coloured light may be reflected from thence in the direction *d*M, where the orange-coloured ſtreaks will be formed; and, for the ſame reaſon, another ſtreak of orange will be formed at *m*, by the rays which enter the atmoſphere on the other ſide of the chink. In a ſimilar manner he accounts for the orange-coloured fringes at the borders of the white ſtreaks, in the experiment of the hoop.

The blue rays, which are not reflected at R, he ſuppoſes, paſs on to I; and that of theſe rays the blue tinge obſervable in the ſhadows of ſome bodies are formed.

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This hypotheſis uſeleſs and ill-founded.

We may here make a general obſervation, applicable to all the attempts of philoſophers to explain theſe phenomena by atmoſpheres. Theſe attempts give no explanation whatever of what is attempted, *i. e.* the phyſical cauſe of the phenomena. A phenomenon is ſome individual fact or event in nature. We are ſaid to explain it when we point out the *general fact* in which it is comprehended, and ſhow the manner in which it is ſo comprehended, or the particular modification of the general *fact*. Philoſophy reſembles natural hiſtory, having for its ſubject the *events* of nature; and its inveſtigations are nothing but the claſſification of theſe events, or the arrangement of them under the general facts of which they are individual inſtances. In the preſent inſtance there is no general *fact* referred to. The atmoſphere is a mere gratuitous ſuppoſition; and all that is done is to ſhow a reſemblance between the phenomena of inflection of light to what would be the phenomena were bodies ſurrounded with ſuch atmoſpheres; and even in this point of view, the diſcuſſions of Mairan and Du Tour are extremely deficient. They have been ſatisfied with very vague reſemblances to a fact obſerved in *one ſingle inſtance*, and not ſufficiently examined or deſcribed in that inſtance, namely, the refraction of light through the atmoſphere of this globe.

The attempt is to explain how light is turned out of its direction by paſſing near the ſurface of bodies. This indicates the action of forces in a direction tranſverſe to that of the light. Newton took the right road of inveſtigation, by taking the phenomenon in its original ſimplicity, and attending merely to this, that the rays *are* deflected from their former courſe; and the ſole aim of his inveſtigation was to diſcover the laws, *i. e.* the more general facts in this deflection. He deduced from the phenomena, that ſome rays are more deflected than others, and endeavoured to determine in what rays the deflections are moſt remarkable: and no experiment of M. Du Tour has ſhown that he was miſtaken in his modified aſſertion, that thoſe rays are moſt inflected which paſs neareſt to the body. We ſay *modified aſſertion;* for Newton points out with great ſagacity many inſtances of alternate fits of *inflection* and *deflection;* and takes it for granted, that the law of continuity is obſerved in theſe phenomena, and that the chngae of inflection into deflection is gradual.

But theſe analogical diſcuſſions are eminently deficient in another reſpect: They are *(prima facie)* held out as mechanical explanations of the changes of motion obſerved in rays of light. When it ſhall be ſhown, that theſe are preciſely ſuch as are obſerved in refracting atmoſpheres, nothing is done towards deciding the original queſtion; for the action of refracting atmoſpheres preſents it in all its difficulties, and we muſt ſtill aſk *how do theſe atmoſpheres produce this effect?* No advance whatever is gained in ſcience by thruſting in this hypothetical atmoſphere; and Newton did wiſely in attaching himſelf to the ſimple fact: and he thus gives us another ſtep in ſcience, by ſhowing us a fact unknown before, *viz.* that the action of bodies on light is not confined to tranſparent bodies. He then added another general fact to our former ſtock, *that light as well as other matter is acted on at a diſtance;* and thus he made a very important deduction, *that reflection,*

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Reflection, refraction, and inflection probably produced by the ſame forces.

flection, refraction, and inflection, are probably brought about by the ſame forces.

We would extend this obſervation to all attempts of philoſophers to explain the phenomena of nature by the *immediate* action of inviſible fluids, magnetical, electrical, nervous, ethers, &c. and we would add that, all of them are equally illogical. They are all attempts to explain changes of motion by impulſe; and proceed on the previous ſuppoſition, that the changes of motion by impulſe are perfectly underſtood; a ſuppoſition quite gratuitous, nay falſe. We may challenge any philoſopher to demonſtrate, from unexceptionable principles, and by juſt argument, what will be the effect of one particle of matter in motion meeting with another particle at reſt, theſe two particles conſtituting the whole of the univerſe. The queſtion is to this day undecided.

But this is not all—changes of motion by impulſe are very familiar, and the general laws are pretty well known; ſo that when it can be ſhown that impulſe really operates in a phenomenon, we are ſatisfied with the explanation. When we ſee a glaſs ball hanging as a pendulum put in motion by the ſtroke of another equal ball ſimilarly ſuſpended, we think its motion is ſufficiently explained by the common laws of colliſion. But this is a very incomplete view of the matter. It remains to be proved, that the motion was really produced by impulſe, that is, by the one ball's coming into contact with the other; and we ſhall find that *real* impulſe is far from being ſo familiar as we imagine.

When one object glaſs of a very long teleſcope lies upon another, nothing is obſerved at the place of contact of the two ſpherical glaſſes, unleſs the weight of the upper one be conſiderable; in which caſe a greaſy-like ſpot is obſerved. If now the upper glaſs be preſſed on the other, the ſpot will increaſe in diameter, and have a coloured margin. By gradually increaſing the preſſure, the breadth of the coloured ſpot will increaſe, and it will be found to conſiſt of concentric arches of different colours, increaſing in number and breadth by an increaſe of preſſure. When this is ſufficiently great, a black or unreflecting ſpot appears in the middle, ſharply defined, with a ſilvery margin, and increaſing in breadth with the preſſure. No additional preſſure makes any change excepting in the diameters of the coloured rings. When the preſſure is gradually diminiſhed, the rings contract, the black ſpot vaniſhes, and all the colours vaniſh in the contrary order to that of their firſt appearance. When the preſſure is meaſured, which is neceſſary for producing the black ſpot, it is found conſiderably to exceed 800 pounds for every ſquare inch of the black ſpot.

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800 pounds weight on every ſquare inch neceſſary to bring two bodies into apparent contact.

It is inconteſtably proved, that the coloured rings are produced by the reflection of light in thoſe parts where the glaſſes are at certain ſmall diſtances from each other, meaſurable by means of the diameters of the coloured rings and the diameter of the ſpheres, of which the adjoining ſurfaces of the glaſſes are portions; and the want of reflection in the middle ſeems to indicate the want of this neceſſary diſtance, and that the two glaſſes are there in contact, making but one, their ſurfaces being flattened by compreſſion. The glaſſes ſeem to be kept aſunder by mutual forces, which are overcome by external preſſure, and which again ſeparate them when the preſſure is removed.

When therefore the glaſs ball mentioned above puts the other in motion by ſtriking it, we are entitled to ſay, that unleſs the preſſure during the ſtroke has been equal to 800 pounds for every ſquare inch of contact, the motion has been produced without contact or real impulſe, by the action of repulſive forces exerted between the balls, in the ſame manner as would happen between two magnets floating on cork with their north poles fronting each other; in which caſe (if the motion has been ſufficiently ſlow) the ſtriking magnet will be brought to reſt, and the other move off, with its original velocity, in the ſame manner as happens to the glaſs balls. Many ſuch communications of motion happen, where we cannot ſay that the impulſive preſſure is greater than that now mentioned; and in ſuch caſes we are well entitled to ſay, that the motion has been produced without real impulſe, by repulſive forces acting at a diſtance. This evidently diminiſhes to a great degree the familiarity of the fact of impulſe.

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Motion produced without impulſe.

But we conclude too haſtily, from the phenomena of the object glaſſes, that a preſſure exceeding 800 pounds on the ſquare inch will produce contact.

Blow a ſoap bubble, and let it fall on a piece of cloth, and cover it with a glaſs bell: after ſome time you will obſerve rings of colours on its upper part, which will increaſe in number and breadth, and be in every reſpect ſimilar to thoſe between the object glaſſes. Theſe ariſe from the gradual thinning of the upper part of the ſoap bubble; a certain thickneſs of this, as well as of the interval between the glaſſes, invariably reflecting a certain colour. At laſt a black ſpot appears a-top, which is ſharply defined, and increaſes in diameter. Soon after this the bubble burſts. Thus then there is a certain thickneſs neceſſary for enabling the plate of ſoap ſuds to reflect light ſo as to be very ſenſible. Analogy obliges us to extend this to the object glaſſes, and to ſay, not that the glaſſes touch each other through the extent of the black ſpot, but that their diſtance is there too ſmall for the ſenſible reflection of light; and it remains undecided whether any preſſure, however great, can annihilate all diſtance between them. So far, therefore, from impulſe being a familiar fact, and its ſuppoſed laws being proper and logical principles of reaſoning and explanation, it appears extremely doubtful whether the fact has *ever* been obſerved; and it muſt therefore be againſt the rules of logic to adduce the laws of impulſe for the explanation of any abſtruſe phenomenon.

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It is doubtful whether impulſe has ever been obſerved.

Ether and other fluid atmoſpheres have often been reſorted to by philoſophers puzzled for an explanation; and all this trouble has been taken to avoid the ſuppoſed difficulty of bodies acting at a diſtance. We now ſee that this is only putting the difficulty a ſtep farther off. We may here add, that in all theſe attempts the very thing is ſuppoſed which the philoſophers wiſh to avoid. Theſe ethers have been fitted for their taſks by ſuppoſing them of variable denſities. It is quite eaſy to ſhow, that ſuch a variation in denſity cannot be conceived without ſuppoſing the particles to act on particles not in contact with them, and to a diſtance as great as that to which the change of denſity extends. The very ſimpleſt form of an elaſtic fluid ſuppoſes this, either with reſpect to its own particles, or with reſpect to the particles of a ſtill more ſubtile.

67
Suppoſed ethers furniſh no account of the phenomena of inflection.

ſubtile fluid, from the interſperſion of which it derives its elaſticity. To get rid of one action at a diſtance, therefore, we introduce millions. Inſtead, therefore, of naturaliſts pluming themſelves on ſuch explanations, and having recourſe, in all their difficulties, to the *ether of Sir Iſaac Newton*, which they make a drudge, a *Mungo here, Mungo there, Mungo everywhere*; let us rather wonder how that great man, not more eminent for penetration and invention than for accuracy of conception and juſtneſs of reaſoning, ſhould ſo far forget himſelf, and deviate from that path of logical inveſtigation in which he had moſt ſucceſsfully advanced, and ſhould, in his fabrication of ether, and application of it to explain the more abſtruſe phenomena of nature, at once tranſgreſs *all* the rules of philoſophizing which he had preſcribed to himſelf and others. Let this ſlip, this mark of frail mortality, put us on our guard, leſt we alſo be ſeduced by the ſpecious offers of explanation which are held out to us by means of inviſible atmoſpheres of every kind.

68 Objects ſometimes magnified by the inflection of light.

M. Le Cat has well explained a phenomenon of viſion depending upon the inflection of light, which ſhows, that, in ſome caſes objects appear magnified by this means. Looking at a diſtant ſteeple, when a wire, of a leſs diameter than the pupil of his eye, was held pretty near to it, and drawing it ſeveral times betwixt his eye and that object, he was ſurpriſed to find, that, every time the wire paſſed before his pupil, the ſteeple ſeemed to change its place, and ſome hills beyond the ſteeple ſeemed to have the ſame motion, juſt as if a lens had been drawn betwixt his eye and them.

Examining this appearance more attentively, he found that there was a poſition of the wire, but very difficult to keep, in which the ſteeple ſeemed not to have any motion, when the wire was paſſed before his eye; and in this caſe the ſteeple appeared leſs diſtinctly, and ſeemed to be magnified. Theſe effects being ſimilar to thoſe of a lens, he attended to them more particularly; and placed his eye in ſuch a manner with reſpect to the ſteeple, that the rays of light by which he ſaw it muſt come very cloſe to the edge of a window, where he had placed himſelf to make his obſervations. Then paſſing the wire once more before his eye, he obſerved, that, when it was in the viſual axis, the ſteeple appeared nearer to the window, on whichever ſide the wire was made to approach. He repeated this experiment, and conſtantly with the ſame reſult, the object being always magnified, and nearly doubled, by this means.

Plate CCCLIII.

This phenomenon is eaſily explained by fig. 14. in which B repreſents the eye, A the ſteeple, and C the diameter of the wire. The black lines expreſs the cone of light by which the natural image of the ſteeple A is formed, and which is much narrower than the diameter of the wire C; but the dotted lines include not only that cone of light, ſtopped and turned out of its courſe by the wire, but alſo more diſtant rays inflected by the wire, and thereby thrown more converging into the pupil; juſt as would have been the effect of the interpoſition of a lens between the eye and the object. The reſult of this experiment was the ſame, whatever ſubſtances he made uſe of in the place of the wire, provided they were of the ſame diameter.

§ 5. *Diſcoveries concerning Viſion.*

69 Diſcoveries of Maurolycus, Kepler, &c. concerning viſion.

Maurolycus was the firſt who ſhowed the true theory of viſion, by demonſtrating that the cryſtalline humour of the eye is a lens which collects the light iſſuing from external objects, and throws them upon the retina, where is the focus of each pencil. He did not however find out, that, by means of this refraction of the rays, an image of every viſible object was formed upon the retina, though this ſeems hardly to have been a ſtep beyond the diſcovery he had already made. Montucla indeed conjectures, that he was prevented from mentioning this part of the diſcovery by the difficulty of accounting for the upright appearance of objects, as the image on the retina is always inverted. This diſcovery was made by Kepler; but he, too, was much difficulted with the inverted poſition of the image. The rectification of theſe images, he ſays, is the buſineſs of the mind; which, when it perceives an impreſſion on the lower part of the retina, conſiders it as made by rays proceeding from the higher parts of objects; tracing the rays back to the pupil, where they croſs one another. But this hypotheſis can ſcarcely be deemed ſatisfactory.—Kepler did not pretend to account for the manner in which the mind perceives the images upon the retina, and very much blames Vitellio for attempting prematurely to determine a queſtion of this nature, and which indeed, he ſays, does not belong to optics. He accounts, however, though not in a ſatisfactory manner, for the power we have of ſeeing diſtinctly at different diſtances.

70 Diſcoveries of Scheiner.

The diſcovery concerning viſion was completed by Scheiner. For, in cutting away the coats of the back part of the eyes of ſheep and oxen, and preſenting ſeveral objects before them, within the uſual diſtance of viſion, he ſaw their images diſtinctly and beautifully painted upon the retina. He did the ſame thing with the human eye, and exhibited this curious experiment at Rome in 1625. He takes particular notice of the reſemblance between the eye and the camera obſcura, and explains a variety of methods to make the images of objects erect. As to the images of objects being inverted in the eye, he acquieſces in the reaſon given for it by Kepler. He knew that the pupil of the eye is enlarged in order to view remote objects, and that it is contracted while we are viewing thoſe that are near; and this he proved by experiment, and illuſtrated by figures.

Scheiner alſo took a good deal of pains to aſcertain the denſity and refractive power of all the humours of the eye, by comparing their magnifying power with that of water or glaſs in the ſame form and circumſtances. The reſult of his inquiries was, that the aqueous humour doth not differ much from water in this reſpect, nor the cryſtalline from glaſs; and that the vitreous humour is a medium between both. He alſo very accurately and minutely traces the progreſs of the rays of light through all the humours of the eye; and after diſcuſſing every poſſible hypotheſis concerning the proper ſeat of viſion, he demonſtrates that it is in the retina, and ſhows that this was the opinion of Alhazen, Vitellio, Kepler, and all the moſt eminent philoſophers. He produces many reaſons of his own for this hypotheſis; anſwers a great number of objections to it; and, by a variety of arguments, refutes the opinion of former times, that the ſeat of viſion is in the cryſtalline.

71 Diſcoveries of Deſcartes.

Deſcartes makes a good number of obſervations on the phenomena of viſion. He explains ſatisfactorily the natural methods of judging of the magnitudes, ſituations, and diſtances, of objects, by the direction of the optic axes; comparing it to a blind man's judging of the ſize and diſtance of an object, by feeling at it with two ſticks of a known length, when the hands in which he holds them are at a known diſtance from each other. He alſo obſerves, that having been accuſtomed to judge of the ſituation of objects by their images falling on a particular part of the eye; if by any diſtortion of the eye they fall on a different place, we are apt to miſtake their ſituation, or imagine one object to be two; as till we become accuſtomed to it, we imagine one ſtick to be two, when it is placed between two contiguous fingers laid acroſs one another. But he obſerves, that all the methods we have of judging of the diſtances of objects are very uncertain, and extend but to narrow limits. The direction of the optic axes, he ſays, will not ſerve us beyond 15 or 20 feet, and the change of form of the cryſtalline not more than three or four feet. For he imagined that the eye conforms itſelf to the view of near or diſtant objects by a change in the curvature of the cryſtalline which he ſuppoſed to be a muſcle, the tendons of it being the proceſſus ciliares. In another place, he ſays, that the change in the conformation of the eye is of no uſe to us for the purpoſe of judging of diſtances beyond four or five feet, and the angle of the optic axes not more than 100 or 200 feet; for this reaſon, he ſays, that the ſun and moon are conceived to be much more nearly of the ſame ſize than they are in reality. White and luminous objects, he ſays, appear larger than others, and alſo the parts contiguous to thoſe on which the rays actually impinge; and for the ſame reaſon, if the objects be ſmall, and placed at a great diſtance, they will always appear round, the figure of the angles diſappearing.

72 Berkeley's theory of viſion.

The celebrated Berkeley biſhop of Cloyne, publiſhed, in 1709, *An Eſſay towards a New Theory of Viſion*, which contains the ſolution of many difficulties. He does not admit that it is by means of thoſe lines and angles, which are extremely uſeful in explaining the theory of optics, that different diſtances are judged of by the ſenſe of ſight; neither does he think that the mere direction of the optic axes or the greater or leſs divergency of the rays of light are ſufficient for this purpoſe. "I appeal (ſays he) to any one's experience, whether, upon ſight of an *object*, he compute its diſtance by the bigneſs of the angle made by the meeting of the two *optic axes*? or whether he ever thinks of the greater or leſs divergency of the rays which arrive from any point to his pupil? Nay, whether it be not perfectly impoſſible for him to perceive, by ſenſe, the various angles wherewith the rays according to their greater or leſſer divergency fell upon his eye?" That there is a neceſſary connexion between theſe various angles, &c. and different degrees of diſtance, and that this connexion is known to every perſon ſkilled in optics, he readily acknowledges; but "in vain (ſays he) ſhall all the mathematicians in the world tell me, that I *perceive* certain *lines* and *angles*, which introduce into my mind the various notions of *diſtance*, ſo long as I am myſelf conſcious of no ſuch thing." Diſtance, magnitude, and even figure, he maintains to be the objects of immediate perception only by the ſenſe of touch; and that when we judge of them by ſight, it is from different ſenſations felt in the eye which experience has taught us to be the conſequence of viewing objects of greater or leſs magnitude, of different figures, and at different diſtances. Theſe various ſenſations, with the reſpective diſtances figures, and magnitudes by which they are occaſioned, become ſo cloſely aſſociated in the mind long before the period of diſtinct recollection, that the preſence of the one inſtantly ſuggeſts the other; and we attribute to the ſenſe of ſight thoſe notions which are acquired by the ſenſe of touch, and of which certain *viſual* ſenſations are merely the ſigns or ſymbols, juſt as words are the ſymbols of ideas. Upon theſe principles he accounts, in a manner worthy of the reader's attention, for a ſingle viſion by both eyes, and for our perceiving objects erect by inverted images of them on the retina tunica. Subſequent writers have made great diſcoveries in the theory of viſion; and among them there is hardly any one to whom this branch of ſcience is ſo much indebted as to Dr Reid. Their reaſonings, however, our limits will not permit us to detail, nor do they properly belong to this part of the article; they are connected with the deſcription of the eye itſelf, the various modes of viſion, and optical deceptions to which we are liable; and theſe will be conſidered in a ſucceeding part of this treatiſe.

§ 6. *Of Optical Inſtruments, and diſcoveries concerning them.*

73 Invention of ſpectacles.

So little were the ancients acquainted with the ſcience of optics, that they ſeem to have had no inſtruments of the optical kind, excepting the glaſs globes and ſpeculums formerly mentioned, which they uſed in ſome caſes for magnifying and burning. Alhazen, as we have ſeen, gave the firſt hint of the invention of ſpectacles, and it is probable that they were found out ſoon after his time. From the writings of Alhazen, together with the obſervations and experiments of Roger Bacon, it is not improbable that ſome monks gradually hit upon the conſtruction of ſpectacles; to which Bacon's leſſer ſegment, notwithſtanding his miſtake concerning it, was a nearer approach than Alhazen's larger one. Whoever they were that purſued the diſcoveries of Bacon, they probably obſerved, that a very ſmall convex glaſs, when held at a greater diſtance from the book, would magnify the letters more than when it was placed cloſe to them, in which poſition only Bacon ſeems to have uſed it. In the next place, they might try whether two of theſe ſmall ſegments of a ſphere placed together, or a glaſs convex on both ſides, would not magnify more than one of them. They would then find, that two of theſe glaſſes, one for each eye, would anſwer the purpoſe of reading better than one; and, laſtly, they might find, that different degrees of convexity ſuited different perſons.

It is certain that ſpectacles were well known in the 13th century, and not long before. It is ſaid that

Alexander Spina, a native of Piſa, who died in 1313, and who was very ingenious in executing whatever he ſaw or heard of as having been done by others, happened to ſee a pair of ſpectacles in the hands of a perſon who would not explain them to him; but that he ſucceeded in making a pair for himſelf, and immediately made the conſtruction public for the good of others. It is alſo inſcribed on the tomb of Salvinus Armatus, a nobleman of Florence, who died 1317, that he was the inventor of ſpectacles.

74 Of concave glaſſes.

The uſe of concave glaſſes, to help thoſe perſons who are ſhort-ſighted, was probably a diſcovery that followed not long after that of convex ones, for the relief of thoſe whoſe ſight is defective in the contrary extreme, though we find no trace of this improvement. Whoever made this diſcovery, it was probably the reſult of nothing more than a random experiment. Perhaps a perſon who was ſhort-ſighted, finding that convex glaſſes did him more harm than good, had the curioſity to make trial of a contrary curvature of the glaſs.

75 Deſcartes's account of the invention of teleſcopes.

From this time, though both convex and concave lenſes were ſufficiently common, yet no attempt was made to form a teleſcope by a combination of them, till the end of the 16th century. Deſcartes conſiders James Metius, a perſon who was no mathematician, though his father and brother had applied to thoſe ſciences, as the firſt conſtructor of a teleſcope: and ſays, that as he was amuſing himſelf with making mirrors and burning glaſſes, he caſually thought of looking through two of his lenſes at a time; and that happening to take one that was convex and another that was concave, and happening alſo to hit upon a pretty good adjuſtment of them, he found, that, by looking through them, diſtant objects appeared very large and diſtinct. In fact, without knowing it, he had made a teleſcope.

76 Other accounts.

Other perſons ſay, that this great diſcovery was firſt made by John Lipperſheim, a maker of ſpectacles at Middleburgh, or rather by his children; who, like Metius, were diverting themſelves with looking through two glaſſes at a time, and placing them at different diſtances from one another. But Borellus, the author of a book entitled, *De vero teleſcopii inventore*, gives this honour to Zacharias Joannides, i. e. Janſen, another maker of ſpectacles at the ſame place, who made the firſt teleſcope in 1590; and it ſeems now to be the general opinion, that this account of Borellus is the moſt probable.

77 Borellus's account probably the true one.

Indeed, Borellus's account of the diſcovery of teleſcopes is ſo circumſtantial, and ſo well authenticated, that it does not ſeem poſſible to call it in queſtion. It is not true, he ſays, that this great diſcovery was made by a perſon who was no philoſopher: for Zacharias Janſen was a diligent inquirer into nature; and being engaged in theſe purſuits, he was trying what uſes could be made of lenſes for thoſe purpoſes, when he fortunately hit upon the conſtruction.

This ingenious mechanic, or rather philoſopher, had no ſooner found the arrangement of glaſſes that produced the effect he deſired, than he encloſed them in a tube, and ran with his inſtrument to Prince Maurice; who, immediately conceiving that it might be of uſe to him in his wars, deſired the author to keep it a ſecret. But this, though attempted for ſome time, was found to be impoſſible; and ſeveral perſons in that city immediately applied themſelves to the making and ſelling of teleſcopes. One of the moſt diſtinguiſhed of theſe was Hans Laprey, called *Lipperſheim* by Sirturus. By him ſome perſon in Holland being very early ſupplied with a teleſcope, he paſſed with many for the inventor; but both Metius above mentioned, and Cornelius Drebell of Alcmaar, in Holland, applied to the inventor himſelf in 1620; as alſo did Galileo, and many others. The firſt teleſcope made by Janſen did not exceed 15 or 16 inches in length; but Sirturus, who ſays that he had ſeen it, and made uſe of it, thought it the beſt that he had ever examined.

78 The firſt teleſcope an exceedingly good one.

Janſen, having a philoſophical turn, preſently applied his inſtrument to ſuch purpoſes as he had in view when he hit upon the conſtruction. Directing it towards celeſtial objects, he diſtinctly viewed the ſpots on the ſurface of the moon; and diſcovered many new ſtars, particularly ſeven pretty conſiderable ones in the Great Bear. His ſon Joannes Zacharias, noted the lucid circle near the limb of the moon, from whence ſeveral bright rays ſeem to dart in different directions: and he ſays, that the full moon, viewed through this inſtrument, did not appear flat, but was evidently ſpherical, the middle part being prominent. Jupiter alſo, he ſays, appeared round, and rather ſpherical; and ſometimes he perceived two, ſometimes three, and at the moſt four ſmall ſtars, a little above or below him; and, as far as he could obſerve, they performed revolutions round him; but this, he ſays, he leaves to the conſideration of aſtronomers. This, it is probable, was the firſt obſervation of the ſatellites of Jupiter, though the perſon who made it was not aware of the importance of his diſcovery.

79 Honour of the invention claimed by Fontana.

One Francis Fontana, an Italian, alſo claims the invention; but as he did not pretend to have made it before the year 1608, and as it is well known that the inſtruments were made and ſold in Holland ſome time before, his pretenſions to a ſecond diſcovery are not much regarded.

80 A teleſcope made by Galileo without ſeeing one.

There are ſome who ſay that Galileo was the inventor of teleſcopes; but he himſelf acknowledges, that he firſt heard of the inſtrument from a German; but he ſays, that being informed of nothing more than the effects of it, firſt by common report, and a few days after by a French nobleman, J. Badovere, at Paris, he himſelf diſcovered the conſtruction, by conſidering the nature of refraction: and thus he had much more real merit than the inventor himſelf.

The account of what Galileo actually did in this buſineſs is ſo circumſtantially related by the author of his life, prefixed to the quarto edition of his works, printed at Venice in 1744, and it contains ſo many particulars, which cannot but be pleaſing to every perſon who is intereſted in the hiſtory of teleſcopes, that we ſhall abridge a part of it, intermixing circumſtances collected from other accounts.

81 Account of his diſcoveries.

About April or May, in 1609, it was reported at Venice, where Galileo (who was profeſſor of mathematics in the univerſity of Padua) then happened to be, that a Dutchman had preſented to Count Maurice of Naſſau, a certain optical inſtrument, by means of which, diſtant objects appeared as if they were near; but no farther account of the diſcovery had reached that place, though this was near 20 years after the firſt diſcovery. Struck, however, with this account, Galileo inſtantly returned to Padua, conſidering what kind of an inſtrument this muſt be. The night following, the conſtruction occurred to him; and the day after, putting the parts of the inſtrument together, as he had previouſly conceived of it, and notwithſtanding the imperfection of the glaſſes that he could then procure, the effect anſwered his expectations, as he preſently acquainted his friends at Venice, to which place he ſix days afterwards carried another and a better inſtrument that he had made, and where, from ſeveral eminences, he ſhowed to ſome of the principal ſenators of that republic a variety of diſtant objects, to their very great aſtoniſhment. When he had made farther improvements in the inſtrument, he, with his uſual generoſity and frankneſs in communicating his diſcoveries, made a preſent of one of them to the Doge, Leonardo Donati, and at the ſame time to all the ſenate of Venice; giving along with the inſtrument a written paper, in which he explained the ſtructure and wonderful uſes that might be made of it both by land and at ſea. In return for ſo noble an entertainment, the republic, on the 25th of Auguſt, in the ſame year, more than tripled his ſalary as profeſſor.

Our philoſopher, having amuſed himſelf for ſome time with the view of terreſtrial objects, at length directed his tube towards the heavens; and, obſerving the moon, he found that the ſurface of it was diverſified with hills and valleys, like the earth. He found that the *via lactea* and *nebulæ* conſiſted of a collection of fixed ſtars, which, on account either of their vaſt diſtance, or extreme ſmallneſs, were inviſible to the naked eye. He alſo diſcovered innumerable fixed ſtars diſperſed over the face of the heavens, which had been unknown to all the ancients; and examining Jupiter, with a better inſtrument than any he had made before, he found that he was accompanied by four ſtars, which, in certain fixed periods, performed revolutions round him, and which, in honour of the houſe of Medicis, he called *Medicean planets*.

This diſcovery he made in January 1610, new ſtyle; and continuing his obſervations the whole of February following, in the beginning of March next he publiſhed an account of all his diſcoveries, in his *Nuncius Sidereus*, printed at Venice, and dedicated to Coſmo great duke of Tuſcany, who, by a letter which he wrote to him on the 10th of July 1610, invited him to quit Padua, and aſſigned him an ample ſtipend, as primate and extraordinary profeſſor at Piſa, but without any obligation to read lectures, or to reſide.

The extraordinary diſcoveries contained in the Nuncius Sidereus, which was immediately reprinted both in Germany and France, were the cauſe of much ſpeculation and debate among the philoſophers and aſtronomers of that time; many of whom could not be brought to give any credit to Galileo's account, while others endeavoured to decry his diſcoveries as being nothing more then fictions or illuſions. Some could not be prevailed upon even to look through a teleſcope; ſo devoted were they to the ſyſtem of Ariſtotle, and ſo averſe to admit any other ſource of knowledge beſides his writings. When it was found to be in vain to oppoſe the evidence of ſenſe, ſome did not ſcruple to aſſert that the invention was taken from Ariſtotle; and producing a paſſage from his writings, in which he attempts to give a reaſon why ſtars are ſeen in the day time from the bottom of a deep well, ſaid, that the well correſponded to the tube of the teleſcope, and that the vapours which aroſe from it gave the hint of putting glaſſes into it; and, laſtly, that in both caſes the ſight is ſtrengthened by the tranſmiſſion of the rays through a thick and dark medium. Galileo himſelf tells this ſtory with a great deal of humour; comparing ſuch men to alchymiſts, who imagine that the art of making gold was known to the ancients, but lay concealed under the fables of the poets.

In the beginning of July of the ſame year, 1610, Galileo being ſtill at Padua, and getting an imperfect view of Saturn's ring, imagined that that planet conſiſted of three parts; and therefore, in the account which he gave of this diſcovery to his friends, he calls it *planetam tergeminam*.

Whilſt he was ſtill at Padua, which muſt have been either in the ſame month of July, or the beginning of Auguſt following, he obſerved ſome ſpots on the face of the ſun: but, contrary to his uſual cuſtom, he did not chooſe, at that time, to publiſh his diſcovery; partly for fear of incurring more of the hatred of many obſtinate Peripatetics; and partly in order to make more exact obſervations on this remarkable phenomenon, and to form ſome conjecture concerning the probable cauſe of it. He therefore contented himſelf with communicating his obſervations to ſome of his friends at Padua and Venice, among whom we find the name of Father Paul. This delay, however, was the cauſe of this diſcovery being conteſted with him by the famous Scheiner, who likewiſe made the ſame obſervation in Oct. 1611, and we ſuppoſe had anticipated Galileo in the publication of it.

About the end of Auguſt, Galileo left Padua and went to Florence; and in November following he was ſatisfied, that, from the September preceding, Venus had been continually increaſing in bulk, and that ſhe changed her phaſes like the moon. About the end of March 1611, Galileo went to Rome, where he gratified the cardinals, and all the principal nobility, with a view of the new wonders he had diſcovered in the heavens, and among others the ſolar ſpots.

82
Named
Lynceus
from them.

From theſe diſcoveries Galileo obtained the name of *Lynceus*, after one of the Argonauts, who was famous in antiquity for the acuteneſs of his ſight; and moreover, the marquis of Monticelli inſtituted an academy, with the title of *De Lincei*, and made him a member of it. Twenty-nine years Galileo enjoyed the uſe of his teleſcope, continually enriching aſtronomy with his obſervations: but by too cloſe an application to that inſtrument, and the detriment he received from the nocturnal air, his eyes grew gradually weaker, till in 1639 he became totally blind; a calamity which, however, neither broke his ſpirits, nor interrupted the courſe of his ſtudies.

83
Account
of his teleſcopes.

The firſt teleſcope that Galileo conſtructed magnified only three times; but preſently after, he made another which magnified 18 times; and afterwards, with great trouble and expence, he conſtructed one that magnified 33 times; and with this it was that he diſcovered the ſatellites of Jupiter and the ſpots of the ſun.

84
The rationale of the inſtrument firſt diſcovered by Kepler.

Notwithſtanding Galileo muſt be allowed to have conſiderable merit with reſpect to teleſcopes, it was neither that of the perſon who firſt hit upon the conſtruction, nor that of him who thoroughly explained the *rationale* of the inſtrument. This important ſervice to ſcience was performed by John Kepler, whoſe name is famous on many accounts in the annals of philoſophy, and eſpecially by his diſcovery of the great law of motion reſpecting the heavenly bodies; which is, that the ſquares of their periodical times are as the cubes of their diſtances from the body about which they revolve; a propoſition which, however, was not demonſtrated before Sir Iſaac Newton. Kepler was aſtronomer to ſeveral of the emperors of Germany; he was the aſſociate of the celebrated aſtronomer Tycho Brahe, and the maſter of Deſcartes.

Kepler made ſeveral diſcoveries relating to the nature of viſion; and not only explained the *rationale* of the teleſcope which he found in uſe, but alſo pointed out methods of conſtructing others of ſuperior powers and more commodious application.

It was Kepler who firſt gave a clear explication of the effects of lenſes, in making the rays of a pencil of light converge or diverge. He ſhowed, that a plano-convex lens makes rays that were parallel to its axis, to meet at the diſtance of the diameter of the ſphere of convexity; but that if both ſides of the lens be equally convex, the rays will have their focus at the diſtance of the radius of the circle, correſponding to that degree of convexity. But he did not inveſtigate any rule for the foci of lenſes unequally convex. He only ſays, in general, that they will fall ſomewhere in the medium, between the foci belonging to the two different degrees of convexity. It is to Cavallieri that we owe this inveſtigation. He laid down this rule: As the ſum of both the diameters is to one of them, ſo is the other to the diſtance of the focus. All theſe rules concerning convex lenſes are applicable to thoſe that are concave; with this difference, that the focus is on the contrary ſide of the glaſs, as will be particularly ſhown in the ſecond part of this treatiſe.

85
General reaſon of the effects of teleſcopes.

The principal effects of teleſcopes depend upon theſe plain maxims, viz. That objects appear larger in proportion to the angles which they ſubtend at the eye; and the effect is the ſame whether the pencils of rays, by which objects are viſible to us, come directly from the objects themſelves, or from any place nearer to the eye, where they may have been united ſo as to form an image of the object; becauſe they iſſue again from thoſe points where there is no real ſubſtance, in certain directions, in the ſame manner as they did from the correſponding points in the objects themſelves.

In fact, therefore, all that is effected by a teleſcope is, firſt, to make ſuch an image of a diſtant object, by means of a lens or mirror; and then to give the eye ſome aſſiſtance for viewing that image as near as poſſible: ſo that the angle which it ſhall ſubtend at the eye, may be very large, compared with the angle which the object itſelf would ſubtend in the ſame ſituation. This is done by means of an eye-glaſs, which ſo refracts the pencils of rays, as that they may afterwards be brought to their ſeveral foci by the natural humours of the eye. But if the eye was ſo formed as to be able to ſee the image with ſufficient diſtinctneſs at the ſame diſtance without any eye-glaſs, it would appear to him as much magnified as it does to another perſon who makes uſe of a glaſs for that purpoſe, though he would not in all caſes have ſo large a field of view.

If, inſtead of an eye-glaſs, an object, or the image of an object, be looked at through a ſmall hole in a thin plate or piece of paper, held cloſe to the eye, it may be viewed very near to the eye, and, at the ſame diſtance, the apparent magnitude of the object will be the ſame in both caſes. For if the hole be ſo ſmall as to admit but a ſingle ray from every diſtinct point of the object, theſe rays will fall upon the retina in as many other diſtinct points, and make a diſtinct image. They are only pencils or cones of rays, which have a ſenſible baſe, as the breadth of the pupil, that are capable, by their ſpreading on the retina, of producing an indiſtinct image. As very few rays, however, can be admitted through a ſmall hole, there will ſeldom be light ſufficient to view any object to advantage in this manner.

If no image be actually formed by the foci of the pencils without the eye, yet if, by the help of any eye-glaſs, the pencils of rays ſhall enter the pupil, juſt as they would have done [illegible] without the eye, the viſual angle will be the ſame as if an image had actually been formed in that place. Objects will not appear inverted through this teleſcope, becauſe the pencils which form the images of them, only croſs one another once, *viz.* at the object glaſs, as in natural viſion they do in the pupil of the eye.

86
Galilean teleſcope more difficult of conſtruction than others.

Such is the teleſcope that was firſt diſcovered and uſed by philoſophers; and it is remarkable that it ſhould be of a much more difficult conſtruction than ſome other kinds that have been invented ſince. The great inconvenience attending it is, that the field of view is exceedingly ſmall. For ſince the pencils of rays enter the eye very much diverging from one another, but few of them can be intercepted by the pupil, this inconvenience increaſes with the magnifying power of the teleſcope; ſo that philoſophers at this day cannot help wondering, that it was poſſible, with ſuch an inſtrument, for Galileo and others to have made the diſcoveries they did. It muſt have required incredible patience and addreſs. No other teleſcope, however, than this, was ſo much as thought of for many years after the diſcovery. Deſcartes, who wrote 30 years after, mentions no others as actually conſtructed, though Kepler had ſuggeſted ſome.

87
Teleſcopes improved by Kepler.

It is to this great man that we are indebted for the conſtruction of what we now call the *aſtronomical teleſcope*, being the beſt adapted for the purpoſe of viewing the heavenly bodies. The *rationale* of this inſtrument is explained, and the advantages of it are clearly pointed out, by this philoſopher, in his Catoptrics; but, what is very ſurpriſing, he never actually reduced his excellent theory into practice. Montucla conjectures, that the reaſon why he did not make trial of his new conſtruction was, his not being aware of the great increaſe of the field of view; ſo that being engaged in other purſuits, he might not think it of much conſequence to take any pains about the conſtruction of an inſtrument, which could do little more than anſwer the ſame purpoſe with thoſe of which he was already poſſeſſed. He muſt alſo have foreſeen, that the length of this teleſcope muſt have been greater in proportion to its magnifying power; ſo that it might appear to him to be upon the whole not quite ſo good a conſtruction as the former.

88 His method firſt put in practice by Scheiner.

It was not long, however, before Kepler's new ſcheme of a teleſcope was executed; and the firſt perſon who actually made an inſtrument of this conſtruction was Father Scheiner, who has given a deſcription of it in his *Roſa Urſina*, publiſhed in 1630. If, ſays, he, you inſert two ſimilar lenſes (that is, both convex) in a tûbe, and place your eye at a convenient diſtance, you will ſee all terreſtrial objects inverted, indeed, but magniſied and very diſtinct, with a conſiderable extent of view. He afterwards ſubjoins an account of a teleſcope of a different conſtruction, with two convex eye glaſſes, which again reverſes the images, and makes them appear in their natural poſition. This diſpoſition of the lenſes had alſo been pointed out by Kepler, but had not been reduced to practice by him, any more than the former. This conſtruction, however, anſwered the end but very imperfectly; and Father Rheita preſently after hit upon a better conſtruction, uſing three eye glaſſes inſtead of two. This got the name of the *terreſtrial teleſcope*, being chiefly uſed for terreſtrial objects.

The firſt and laſt of theſe conſtructions are thoſe which are now in common uſe. The proportion in which the firſt teleſcope magnifies, is as the focal length of the object-glaſs to that of the eye-glaſs.—The only difference between the Galilean teleſcope and the other is, that the pencils by which the extremities of any object are ſeen in this caſe, enter the eye diverging; whereas, in the other, they enter it converging; but if the ſphere of concavity in the eye-glaſs of the Galilean teleſcope be equal to the ſphere of convexity in the eye-glaſs of another teleſcope, their magnifying power will be the ſame. The concave eye-glaſs, however, being placed between the object-glaſs and its focus, the Galilean teleſcope will be ſhorter than the other, by twice the focal length of the eye-glaſs. Conſequently, if the length of the teleſcopes be the ſame, the Galilean will have the greater magnifying power.

89 Huygens greatly improves the teleſcopes of Scheiner and Rheita.

The invention of the teleſcope and microſcope having incited mathematicians to a more careful ſtudy of dioptrics, and this having ſoon become almoſt a perfect ſcience, by means of the diſcovery of Snellius, many different conſtructions were offered to the public. Huygens was particularly eminent for his ſyſtematic knowledge of the ſubject, and is the author of the chief improvements which have been made on all the dioptrical inſtruments till the time of Mr Dollond's diſcovery. He was well acquainted with the theory of aberration ariſing from the ſpherical figure of the glaſſes, and has ſhowed ſeveral ingenious methods of diminiſhing them by proper conſtructions of the eye-pieces. He firſt ſhowed the advantages of two eye-glaſſes on the aſtronomical teleſcope and double microſcope, and gave rules for this conſtruction, which both enlarges the field and ſhortens the inſtrument. Mr Dollond adapted his conſtruction to the terreſtrial teleſcope of De Rheita; and his five eye-glaſſes are nothing but the Huygenian eye-piece doubled. This conſtruction has been too haſtily given up by the artiſts of the preſent day for another, alſo of Mr Dollond's, of four glaſſes.

90 Viſion moſt diſtinct in the Galilean teleſcopes.

Viſion is more diſtinct in the Galilean teleſcope than in the other, owing perhaps in part to there being no intermediate image between the eye and the object. Beſides the eye-glaſs being very thin in the centre, the rays will be leſs liable to be diſtorted by irregularities in the ſubſtance of the glaſs. Whatever be the cauſe, we can ſometimes ſee Jupiter's ſatellites very clearly in a Galilean teleſcope not more than twenty inches or two feet long; when one of four or five feet, of the common ſort, will hardly make them viſible.

91 Binocular teleſcope.

The ſame Father Rheita, to whom we are indebted for the uſeful conſtruction of a teleſcope for land objects, invented a binocular teleſcope, which Father Cherubin, of Orleans, endeavoured to bring into uſe afterwards. It conſiſts of two teleſcopes faſtened together, and made to point to the ſame object. When this inſtrument is well fixed, the object appears larger, and nearer to the eye, when it is ſeen through both the teleſcopes, than through one of them only, though they have the very ſame magnifying power. But this is only an illuſion, occaſioned by the ſtronger impreſſion that two equal images, equally illuminated, make upon the eye. This advantage, however, is counterbalanced by the inconvenience attending the uſe of it.

92 Teleſcopes of Campani and Divini.

The firſt who diſtinguiſhed themſelves in grinding teleſcopic glaſſes were two Italians, Euſtachio Divini at Rome, and Campani at Bologna, whoſe fame was much ſuperior to that of Divini, or that of any other perſon of his time; though Divini himſelf pretended, that, in all the trials that were made with their glaſſes, his, of a great focal diſtance, performed better than thoſe of Campani, and that his rival was not willing to try them fairly, *viz*. with equal eye-glaſſes. It is generally ſuppoſed, however, that Campani really excelled Divini, both in the goodneſs and the focal length of his object-glaſſes. It was with teleſcopes made by Campani that Caſſini diſcovered the neareſt ſatellites of Saturn. They were made by the expreſs order of Louis XIV. and were of 86, 100, and 136 Pariſian feet focal length.

Campani ſold his lenſes for a great price, and took every poſſible method to keep his art of making them a ſecret. His laboratory was inacceſſible to all the world, till after his death; when it was purchaſed by Pope Benedict XIV. who made a preſent of it to the academy called the *Inſtitute*, eſtabliſhed in that city; and by the account which M. Fougeroux has given of what he could diſcover from it, we learn, that (except a machine, which M. Campani conſtructed, to work the baſons on which he ground his glaſſes) the goodneſs of his lenſes depended upon the clearneſs of his glaſs, his Venetian tripoli, the paper with which he poliſhed his glaſſes, and his great ſkill and addreſs as a workman. It was alſo the general opinion at Bologna, that he owed a great part of his reputation to the ſecrecy and air of myſtery which he affected; and that he made a great number of object-glaſſes which he rejected, ſhowing only thoſe that were very good. He made few lenſes of a very great focal diſtance; and having the misfortune to break one of 141 feet in two pieces, he took incredible pains to join the two parts together, which he did at length effectually, ſo that it was uſed as if it had been entire; but it is not probable that he would have taken ſo much pains about it, if, as he pretended, he could very eaſily have made another as good.

Sir Paul Neille, Dr Hooke ſays, made teleſcopes of 36 feet, pretty good, and one of 50, but not of proportional goodneſs. Afterwards Mr Reive firſt, and then Mr Cox, who were the moſt celebrated in England as grinders of optic glaſſes, made ſome good ones of 50 and 60 feet focal diſtance, and Mr Cox made one of 100; but how good, Dr Hooke could not aſſert.

Borelli alſo, in France, made object glaſſes of a great focal length, one of which he preſented to the Royal Society; but we do not find any particular account of their goodneſs.

93 Extraordinary object glaſs made by M. Auzout.

With reſpect to the focal length of teleſcopes, theſe and all others were far exceeded by M. Auzout, who made one object-glaſs of 600 feet focus; but he was never able to manage it, ſo as to make any uſe of it. Hartſocker is even ſaid to have made ſome of a ſtill greater focal length; but this ingenious mechanic, finding it impoſſible to make uſe of object-glaſſes the focal diſtance of which was much leſs than this, when they were encloſed in a tube, contrived a method of uſing them without a tube, by fixing them at the top of a tree, a high wall, or the roof a houſe.

94 Teleſcopes uſed without tubes.

Mr Huygens, who was alſo an excellent mechanic made conſiderable improvements in the method of uſing an object-glaſs without a tube. He placed it at the top of a very long pole, having previouſly encloſed it in a ſhort tube, which was made to turn in all directions by means of a ball and ſocket. The axis of this tube he could command with a fine ſilken ſtring, ſo as to bring it into a line with the axis of another ſhort tube which he held in his hand, and which contained the eye-glaſs. In this method he could make uſe of object-glaſſes of the greateſt magnifying power, at whatever altitude his object was, and even in the zenith, provided his pole was as long as his teleſcope; and to adapt it to the view of objects of different altitudes, he had a contrivance, by which he could raiſe or depreſs a ſtage that ſupported his object-glaſs at pleaſure.

M. De la Hire, made ſome improvement in this method of managing the object-glaſs, fixing it in the centre of a board, and not in a tube; but as it is not probable that this method will ever be made uſe of, ſince the diſcovery of both reflecting and achromatic teleſcopes, which are now brought to great perfection, and have even micrometers adapted to them, we ſhall not deſcribe this apparatus minutely; but ſhall only give a drawing of M. Huygens's pole, which, with a very ſhort explanation, will be ſufficient for the purpoſe. In fig. 1. *a* repreſents a pulley, by the help of which a ſtage *c*, *d*, *e*, *f*, (that ſupports the object-glaſs *k*, and the apparatus belonging to it), may be raiſed higher or lower at pleaſure, the whole being counterpoiſed by the weight *b*, faſtened to a ſtring *g*. *n*, Is a weight, by means of which the centre of gravity of the apparatus belonging to the object-glaſs is kept in the ball and ſocket, ſo that it may be eaſily managed by the ſtring *l u*, and its axis brought into a line with the eye-glaſs at *o*. When it was very dark, M. Huygens was obliged to make his object-glaſs viſible by a lantern, *y*, ſo conſtructed as to throw the rays of light in a parallel direction up to it.

Plate CCLIV.

The recollection of the incredible pains which philoſophers of the laſt age took in making obſervations, and the great expences they were obliged to be at for that purpoſe, ſhould make us ſenſible of the obligations we are under to ſuch men as Gregory, Newton, and Dollond, who have enabled us to get clearer and more ſatisfactory views of the remote parts of our ſyſtem, with much leſs labour and expence; and ſhould likewiſe make us more diligent and ſolicitous to derive all the advantages we poſſibly can from ſuch capital improvements.

95 Why dioptric teleſcopes muſt be made ſo long.

The reaſon why it is neceſſary to make the common dioptric teleſcopes ſo very long, is, that the length of them muſt be increaſed in no leſs a proportion than the duplicate of the increaſe of their magnifying power; ſo that, in order to magnify twice as much as before, with the ſame light and diſtinctneſs, the teleſcope muſt be lengthened four times; and to magnify thrice as much, nine times; and ſo on.

96 Of the apertures of refracting teleſcopes.

Before we mention the reflecting teleſcope, it muſt be obſerved, that M. Auzout, in a paper delivered to the Royal Society, obſerved, that the apertures which the object-glaſſes of refracting teleſcopes can bear with diſtinctneſs, are in about a ſub-duplicate proportion to their lengths; and upon this ſuppoſition he drew up a table of the apertures proper for object-glaſſes of a great variety of focal lengths, from 4 inches to 400 feet. Upon this occaſion, however, Dr Hooke obſerved, that the ſame glaſs will bear a greater or leſs aperture, according to the leſs or greater light of the object. If, for inſtance, he was viewing the ſun, or Venus, or any of the fixed ſtars, he uſed ſmaller apertures: but if he wanted to view the moon by daylight; or Saturn, Jupiter, or Mars, by night, he uſed a larger aperture.

But the merit of all theſe improvements was in a manner cancelled by the diſcovery of the much more commodious *reflecting teleſcope*. For a refracting teleſcope, even of 1000 feet focus, ſuppoſing it poſſible to be made uſe of, could not be made to magnify with diſtinctneſs more than 1000 times; whereas a reflecting teleſcope, not exceeding 9 or 10 feet will magnify 1200 times.

97 Hiſtory of the reflecting teleſcope.

"It muſt be acknowledged (ſays Dr Smith in his *Complete Syſtem of Optics*), that Mr James Gregory of Aberdeen was the firſt inventor of the reflecting teleſcope; but his conſtruction is quite different from Sir Iſaac Newton's, and not nearly ſo advantageous."

But, according to Dr Pringle, Merſennus was the man who entertained the firſt thought of a reflector. A teleſcope with ſpecula he certainly propoſed to the celebrated Deſcartes many years before Gregory's invention, though indeed in a manner ſo very unſatisfactory, that Deſcartes, who had given particular attention to the improvement of the teleſcope, was ſo far from approving the propoſal, that he endeavoured to convince Merſennus of its fallacy (B). Dr Smith, it

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(B) *Lettres de Deſcartes*, Tom. II. printed at Paris in 1657, lett. 29. and 32. See this point diſcuſſed by two learned and candid authors, M. le Roy in the *Encyclopédie* under the article *Teleſcope*, and M. Montecula in *Hiſt. de Mathem.* Tom. II. p. 644.

it appears, had never peruſed the two letters of Deſcartes to Merſennus which briefly touch on that ſubject.

Again, As to his aſſertion, that Gregory's conſtruction was not nearly ſo advantageous as Newton's, it may be accounted for from his having ſet it down early in the compoſition of his work, and forgetting to qualify it afterwards, when, before the publication, he had received pretty ſure information to the contrary. Or perhaps he was influenced by the example of Dr Bradley, who had been a moſt ſucceſsful obſerver, and yet had always preferred the Newtonian teleſcope to the other. But we muſt certainly adjudge the ſuperiority to the latter, as that is now, and has been for ſeveral years paſt, the only inſtrument of the kind in requeſt.

Gregory, a young man of an uncommon genius, was led to the invention, in ſeeking to correct two imperfections of the common teleſcope: the firſt was its too great length, which made it leſs manageable; the ſecond, the incorrectneſs of the image. Mathematicians had demonſtr[illegible], that a pencil of rays could not be collected in [illegible] point by a ſpherical lens; and alſo, that the image tranſmitted by ſuch a lens would be in ſome degree incurvated. Theſe inconveniencies he believed would be obviated by ſubſtituting for the object glaſs a metallic ſpeculum, of a parabolic figure, to receive the image, and to reflect it towards a ſmall ſpeculum of the ſame metal: this again was to return the image to an eye-glaſs placed behind the great ſpeculum, which for that purpoſe was to be perforated in its centre. This conſtruction he publiſhed in 1663, in his *Optica Promota*. But as Gregory, by his own account, was endowed with no mechanical dexterity, nor could find any workman capable of realizing his invention, after ſome fruitleſs attempts in that way he was obliged to give up the purſuit: and probably, had not ſome new diſcoveries been made in light and colours, a refracting teleſcope would never more have been thought of, conſidering the difficulty of the execution, and the ſmall advantages that could accrue from it, deducible from the principles of optics that were then known.

But Newton, whoſe genius for experimental knowledge was equal to that for geometry, happily interpoſed, and ſaved this noble invention from well nigh periſhing in its infant ſtate. He likewiſe at an early period of life had applied himſelf to the improvement of the teleſcope; but imagining that Gregory's ſpecula were neither very neceſſary, nor likely to be executed, he began with proſecuting the views of Deſcartes, who aimed at making a more perfect image of an object, by grinding lenſes, not to the figure of a ſphere, but to that of one of the conic ſections. Now, whilſt he was thus employed, three years after Gregory's publication, he happened to take to the examination of the colours, formed by a priſm, and having by the means of that ſimple inſtrument diſcovered the different refrangibility of the rays of light, he then perceived that the errors of teleſcopes ariſing from that cauſe alone, were ſome hundred times greater than ſuch as were occaſioned by the ſpherical figure of lenſes. This circumſtance forced, as it were, Newton to fall into Gregory's track, and to turn his thoughts to reflectors. "The different refrangibility of the rays of light (ſays he, in a letter to Mr Oldenburg, ſecretary to the Royal Society, dated in Feb. 1672) made me take reflections into conſideration; and finding them regular, ſo that the angle of reflection of all ſorts of rays was equal to the angle of incidence, I underſtood that by their mediation optic inſtruments might be brought to any degree of perfection imaginable, providing a reflecting ſubſtance could be found which would poliſh as finely as glaſs, and reflect as much light as glaſs tranſmits, and the art of communicating to it a parabolic figure be alſo obtained. Amidſt theſe thoughts I was forced from Cambridge by the intervening plague, and it was more than two years before I proceeded further."

It appears, then, that if Newton was not the firſt inventor of the reflecting teleſcope, he was the main and effectual inventor. By the force of his admirable genius, he fell upon this new property of light; and thereby found, that all lenſes, of whatever figure, would be affected more or leſs with ſuch priſmatic aberrations of the rays as would be an inſuperable obſtacle to the perfection of a dioptric teleſcope.

It was towards the end of 1668, or in the beginning of the following year, when Newton being thus obliged to have recourſe to reflectors, and not relying on any artificer for making his ſpecula, ſet about the work himſelf, and early in the year 1672 completed two ſmall reflecting teleſcopes. In theſe he ground the great ſpeculum into a ſpherical concave; not but that he approved of the parabolic form propoſed by Gregory, though he found himſelf unable to accompliſh it. In the letter that accompanied one of theſe inſtruments which he preſented to the Society, he writes, "that though he then deſpaired of performing that work (to wit, the parabolic figure of the great ſpeculum) by geometrical rules, yet he doubted not but that the thing might in ſome meaſure be accompliſhed by mechanical devices."

Not leſs did the difficulty appear to find a metallic ſubſtance that would be of a proper hardneſs, have the feweſt pores, and receive the ſmootheſt poliſh; a difficulty in truth which he deemed almoſt unſurmountable, when he conſidered, that every irregularity in a reflecting ſurface would make the rays of light ſtray five or ſix times more out of their due courſe, than the like irregularities in a refracting one. In another letter, written ſoon after, he tells the ſecretary, "that he was very ſenſible that metal reflects leſs light than glaſs tranſmits; but as he had found ſome metallic ſubſtances to be more ſtrongly reflective than others, to poliſh better, and to be freer from tarniſhing than others, ſo he hoped that there might in time be found out ſome ſubſtances much freer from theſe inconveniencies than any yet known." Newton therefore laboured till he found a compoſition that anſwered in ſome degree, and left it to thoſe who ſhould come after him to find a better, and preſented a reflecting teleſcope to the Royal Society; from whom he received ſuch thanks as were due to ſo curious and ſo valuable a preſent. And Huygens, one of the greateſt geniuſes of the age, and himſelf a diſtinguiſhed improver of the refractor, no ſooner was informed by Mr Oldenburg of the diſcovery, than he wrote in anſwer, "that it was an admirable teleſcope; and that Mr Newton had well conſidered the advantage which a concave ſpeculum had above convex glaſſes in collecting the parallel rays, which according to his own calculation was very great: Hence that Mr Newton could give a far greater aperture to that ſpeculum than to an object glaſs of the ſame diſtance of focus, and conſequently much more magnify in his way than by an ordinary teleſcope: Beſides, that by the reflector he avoided an inconvenience inſeparable from object glaſſes, which was the obliquity of both their ſurfaces, which vitiated the refraction of the rays that paſs towards the ſides of the glaſs, and did more hurt than men were aware of: Again, That by the mere reflection of the metalline ſpeculum there were not ſo many rays loſt as in glaſſes, which reflected a conſiderable quantity by each of their ſurfaces, and beſides intercepted many of them by the obſcurity of their matter: That the main buſineſs would be, to find a matter for this ſpeculum that would bear as good and even a poliſh as glaſs. Laſtly, He believed that Mr Newton had not been without conſidering the advantage which a parabolic ſpeculum would have over a ſpherical one in this conſtruction; but had deſpaired, as he himſelf had done, of working other ſurfaces than ſpherical ones with due exactneſs." Huygens was not ſatisfied with thus expreſſing to the ſociety his high approbation of the late invention; but drew up a favourable account of the new teleſcope, which he cauſed to be publiſhed in the *Journal des Sçavans* for the year 1672, and by that channel it was ſoon known over Europe.

But how excellent ſoever the contrivance was; how well ſoever ſupported and announced to the public; yet whether it was that the artiſts were deterred by the difficulty and labour of the work, or that the diſcoveries even of a Newton were not to be exempted from the general fatality attending great and uſeful inventions, *the making a ſlow and vexatious progreſs to the authors;* the fact is, that, excepting an unſucceſsful attempt which the ſociety made, by employing an artificer to imitate the Newtonian conſtruction, but upon a larger ſcale, and a diſguiſed Gregorian teleſcope, ſet up by Caſſegrain abroad as a rival to Newton's, and that in theory only (for it was never put in execution by the author), no reflector was heard of for nearly half a century after. But when that period was elapſed, a reflecting teleſcope was at laſt produced to the world of the Newtonian conſtruction by Dr Hadley, which the author had the ſatisfaction to find executed in ſuch a manner as left no room to fear that the invention would any longer continue in obſcurity.

This memorable event was owing to the genius, dexterity, and application, of Mr Hadley the inventor of the reflecting quadrant, another moſt valuable inſtrument. The two teleſcopes which Newton had made were but ſix inches long, were held in the hand for viewing objects, and in power were compared to a ſix feet refractor; whereas Hadley's was above five feet long, was provided with a well-contrived apparatus for managing it, and equalled in performance the famous aërial teleſcope of Huygens of 123 feet in length. Excepting as to the manner of making the ſpecula, we have, in the Tranſactions of 1723, a complete deſcription, with a figure, of this teleſcope, together with that of the machine for moving it; but, by a ſtrange omiſſion, Newton's name is not once mentioned in that paper, ſo that any perſon not acquainted with the hiſtory of the invention, and reading that account only, might be apt to conclude that Hadley had been the ſole contriver of it.

The ſame celebrated artiſt, after finiſhing two teleſcopes of the Newtonian conſtruction, accompliſhed a third in the Gregorian way; but, it would ſeem, leſs ſucceſsfully, by Dr Smith's declaring ſo ſtrongly in favour of the other. Mr Hadley ſpared no pains to inſtruct Mr Molyneux and the reverend Dr Bradley; and when thoſe gentlemen had made a ſufficient proficiency in the art, being deſirous that theſe teleſcopes ſhould become more public, they liberally communicated to ſome of the principal inſtrument makers of London the knowledge they had acquired from him. Now ſuch ſcholars, as it is eaſy to imagine, ſoon advanced beyond their maſters, and completed reflectors by other and better methods than what had been taught them.

Certain it is, at leaſt, that Mr James Short, as early as the year 1734, had ſig[illegible] himſelf at Edinburgh by his work of this kind. Mr Maclaurin wrote that year to Dr Jurin, "that Mr Short, who had begun with making glaſs ſpecula, was then applying himſelf to improve the metallic; and that, by taking care of the figure, he was enabled to give them larger apertures than others had done; and that upon the whole they ſurpaſſed in perfection all that he had ſeen of other workmen." He added, "that Mr Short's teleſcopes were all of the Gregorian conſtruction; and that he had much improved that excellent invention." This character of excellence Mr Short maintained to the laſt; and with the more facility, as he had been well grounded both in the geometrical and philoſophical principles of optics, and upon the whole was a moſt intelligent perſon in whatever related to his profeſſion. It was ſuppoſed he had fallen upon a method of giving the parabolic figure to his great ſpeculum; a point of perfection that Gregory and Newton had wiſhed for, but deſpaired of attaining; and that Hadley had never, as far as we know, attempted, either in his Newtonian or Gregorian teleſcope. Mr Short indeed ſaid he had acquired that faculty, but never would tell by what peculiar means he effected it; ſo that the ſecret of working that configuration, whatever it was, as far as it then appeared, died with that ingenious artiſt. Mr Mudge, however, hath lately realized the expectation of Sir Iſaac Newton, who, above 100 years ago, preſaged that the public would one day poſſeſs a parabolic ſpeculum, not accompliſhed by mathematical rules, but by mechanical devices.

This was a *deſideratum*, but it was not the only want ſupplied by this gentleman: he has taught us likewiſe a better compoſition of metals for the ſpecula, how to grind them better, and how to give them a finer poliſh; and this laſt part (namely, the poliſh), he remarks, was the moſt difficult and eſſential of the whole operation. "In a word (ſays Sir John Pringle), I am of opinion, there is no optician in this great city (which hath been ſo long and ſo juſtly renowned for ingenious and dexterous makers of every kind of mathematical inſtruments) ſo partial to his own abilities as not to acknowledge, that, however ſome parts of the mechanical proceſs now diſcloſed might have been known before by individuals of the profeſſion, yet that Mr Mudge hath opened to them all ſome new and important lights, and upon the whole hath greatly improved the art of making reflecting teleſcopes."

98 Mr Edwards's improvements of the reflecting teleſcope.

The late reverend and ingenious John Edwards devoted much of his time to the improvement of reflecting teleſcopes, and brought them to ſuch perfection, that Dr Maſkelyne, the aſtronomer royal, found teleſcopes conſtructed by him to ſurpaſs in brightneſs, and other eſſentials, thoſe of the ſame ſize made by the beſt artiſts in London. The chief excellence of his teleſcopes ariſes from the compoſition, which, from various trials on metals and ſemimetals, he diſcovered for the ſpecula, and from the true parabolic figure, which, by long practice, he had found a method of giving them, preferable to any that was known before him. His directions for the compoſition of ſpecula, and for caſting, grinding, and poliſhing them, were publiſhed, by order of the commiſſioners of longitude, at the end of the Nautical Almanack for the year 1787. To the ſame almanack is alſo annexed his account of the cauſe and cure of the tremors which particularly affect reflecting teleſcopes more than refracting one, together with remarks on the ſaid tremors by Dr Maſkelyne. See Telescope.

99 Herſchel's improvements.

But in conſtructing reflecting teleſcopes of extraordinary magnifying powers, Dr Herſchel has diſplayed ſkill and ingenuity ſurpaſſing all his predeceſſors in this department of mechanics. He has made them from 7, 10, 20, to even 40 feet in length; and with the inſtrument of theſe latter dimenſions he is now employed in making diſcoveries in aſtronomy. Of its conſtruction, magnifying powers, and the curious collection of machinery by which it is ſupported and moved from one part of the heavens to another, accounts will be given under the word Telescope.

The greateſt improvement in *refracting* teleſcopes hitherto made public (c) is that of Mr Dollond, of which an account has already been given in a preceding ſection, wherein his diſcoveries in the ſcience of optics were explained. But, beſides the obligation we are under to him for correcting the aberration of the rays of light in the focus of object-glaſſes, ariſing from their different refrangibility, he made another conſiderable improvement in teleſcopes, viz. by correcting, in a great meaſure, both this kind of aberration, and alſo that which ariſes from the ſpherical form of lenſes by an expedient of a very different nature; viz. increaſing the number of eye-glaſſes.

100 Account of Mr Dollond's improvements

If any perſon, ſays he, would have the viſual angle of a teleſcope to contain 20 degrees, the extreme pencils of the field muſt be bent or refracted in an angle of 10 degrees; which, if it be performed by one eye-glaſs, will cauſe an aberration from the figure, in proportion to the cube of that angle; but if two glaſſes are ſo proportioned and ſituated, as that the refraction may be equally divided between them, they will each of them produce a refraction equal to half the required angle; and therefore, the aberration being in proportion to the cube of half the angle taken twice over, will be but a fourth part of that which is in proportion to the cube of the whole angle; becauſe twice the cube of 1 is but $\frac{1}{4}$ of the cube of 2; ſo the aberration from the figure, where two eye-glaſſes are rightly proportioned, is but a fourth of what it muſt unavoidably be, where the whole is performed by a ſingle eye-glaſs. By the ſame way of reaſoning, when the refraction is divided between three glaſſes, the aberration will be found to be but the ninth part of what would be produced from a ſingle glaſs; becauſe three times the cube of 1 is but one-ninth of the cube of 3. Whence it appears, that by increaſing the number of eye-glaſſes, the indiſtinctneſs which is obſerved near the borders of the field of a teleſcope may be very much diminiſhed, though not entirely taken away.

The method of correcting the errors ariſing from the different refrangibility of light is of a different conſideration from the former. For, whereas the errors from the figure can only be diminiſhed in a certain proportion according to the number of glaſſes, in this they may be entirely corrected by the addition of only one glaſs; as we find in the aſtronomical teleſcope, that two eye-glaſſes, rightly proportioned, will cauſe the edges of objects to appear free from colours, quite to the borders of the field. Alſo in the day teleſcope, where no more than two eye-glaſſes are abſolutely neceſſary for erecting the object, we find, that by the addition of a third, rightly ſituated, the colours, which would otherwiſe make the image confuſed, are entirely removed. This, however, is to be underſtood with ſome limitation: for though the different colours into which the extreme pencils muſt neceſſarily be divided by the edges of the eye-glaſſes, may in this manner be brought to the eye in a direction parallel to each other, ſo as, by the humours of the eye, to be made to converge to a point on the retina; yet, if the glaſſes exceed a certain length, the colours may be ſpread too wide to be capable of being admitted through the pupil or aperture of the eye; which is the reaſon, that in long teleſcopes, conſtructed in the common manner, with three eye-glaſſes, the field is always very much contracted.

Theſe conſiderations firſt ſet Mr Dollond on contriving how to enlarge the field, by increaſing the number of eye-glaſſes without any hinderance to the diſtinctneſs or brightneſs of the image; and though others had been about the ſame work before, yet, obſerving that ſome five-glaſs teleſcopes which were then made would admit of farther improvement, he endeavoured to conſtruct one with the ſame number of glaſſes in a

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(c) Dr Blair's diſcovery, mentioned N° 19. will undoubtedly lead to improvements ſuperior to thoſe of Dollond; but as his memoir on the ſubject is not yet publiſhed, we feel not ourſelves at liberty to make longer extracts from it. The reader will ſee the whole in the Philoſophical Tranſactions of the Royal Society of Edinburgh, whenever that body ſhall be pleaſed to favour the public with a third volume of [illegible] arned labours.

better manner; which ſo far anſwered his expectations, as to be allowed by the beſt judges to be a conſiderable improvement on the former.

Encouraged by this ſucceſs, he reſolved to try if he could not make ſome farther enlargement of the field, by the addition of another glaſs, and by placing and proportioning the glaſſes in ſuch a manner as to correct the aberrations as much as poſſible, without any detriment to the diſtinctneſs: and at laſt he obtained as large a field as is convenient or neceſſary, and that even in the longeſt teleſcopes that can be made.

Theſe teleſcopes with ſix glaſſes having been well received, and ſome of them being gone into foreign parts, it ſeemed a proper time to the author to ſettle the date of his invention; on which account he drew up a letter, which he addreſſed to Mr Short, and which was read at the Royal Society, March 1. 1753 (D).

101 Mr Smith's propoſal to ſhorten teleſcopes.

Various other attempts were made about this time to ſhorten and otherwiſe improve teleſcopes. Among theſe we may juſt mention that of Mr Caleb Smith, who, after giving much attention to the ſubject, thought that he had found it poſſible to rectify the errors which ariſe from the different degrees of refrangibility, on the principle that their ſines of refraction, or rays differently refrangible, are to one another in a given proportion, when their ſines of incidence are equal; and the method which he propoſed for this purpoſe was to make the ſpeculums of glaſs inſtead of metal, the two ſurfaces having different degrees of concavity. But we do not find that this ſcheme was ever executed: nor is it probable, for reaſons which have been mentioned, that any advantage could be made of it.

102 Equatorial teleſcope, or portable obſervatory.

To Mr Short we are indebted for the excellent contrivance of an equatorial teleſcope, or, as he likewiſe called it, a *portable obſervatory*: for with it pretty accurate obſervations may be made with very little trouble, by thoſe who have no building adapted to the purpoſe. The inſtrument conſiſts of an ingenious piece of machinery, by the help of which a teleſcope mounted upon it may be directed to any degree of right aſcenſion or declination, ſo that the place of any of the heavenly bodies being known, they may be found without any trouble, even in the day time. Alſo, being made to turn parallel to the equator, any object is eaſily kept in view, or recovered, without moving the eye from its ſituation. By this inſtrument, Mr Short informs us, that moſt of the ſtars of the firſt and ſecond magnitude have been ſeen even at mid day, and the ſun ſhining bright; as alſo Mercury, Venus, and Jupiter. Saturn and Mars are not ſo eaſy to be ſeen, on account of the faintneſs of their light, except when the ſun is but a few hours above the horizon. This particular effect depends upon the teleſcope excluding almoſt all the light, except what comes from the object itſelf, and which might otherwiſe efface the impreſſion made by its weaker light upon the eye. Any teleſcope of the ſame magnifying power would have the ſame effect, could we be ſure of pointing it right. For the ſame reaſon, alſo, it is that ſtars are viſible in the day time from the bottom of a deep pit. Mr Ramſden has lately invented a *portable obſervatory* or *equatorial teleſcope*, which may perhaps ſuperſede the uſe of Mr Short's. See ASTRONOMY, N° 504.

103 How to obſerve the ſtars in the day time.

In order to enable us to ſee the fixed ſtars in the day time, it is neceſſary to exclude the extraneous light as much as poſſible. For this reaſon the greater magnifying power of any teleſcope is uſed, the more eaſily a fixed ſtar will be diſtinguiſhed in the day time; the light of the ſtar remaining the ſame in all magnifying powers of the ſame teleſcope, but the ground upon which it is ſeen becoming darker by increaſing the magnifying power; and the viſibility of a ſtar depends very much upon the difference between its own light and that of the ground upon which it is ſeen. A fixed ſtar will be very nearly equally viſible with teleſcopes of very different apertures, provided the magnifying power remains the ſame.

If a comet, or any other heavenly body, be viewed through this equatorial teleſcope, properly rectified, it is ſeen immediately by the help of the ſame machinery what is its true place in the heavens. Other aſtronomical problems may alſo be ſolved by it, with great eaſe and certainty.

104 Mr Æpinus's propoſal for bending the tubes of teleſcopes.

M. Æpinus propoſes to bend the tubes of long teleſcopes at right angles, fixing a plane mirror in the angle, in order to make them more commodious for viewing objects near the zenith of the obſerver; and he gives particular inſtructions how to make them in this form, eſpecially when they are furniſhed with micrometers. We are alſo informed that a little plane ſpeculum is ſometimes placed betwixt the laſt eye-glaſs and the eye in the reflecting teleſcopes, at an angle of 45°, for the ſame purpoſe.

105 Hiſtory of Microſcopes.

THE invention of MICROSCOPES was not much later than that of teleſcopes; and, according to Borellus, whoſe account we do not find to have been called in queſtion by any perſon, we are indebted for them to the ſame author, at leaſt to Z. Janſen, in conjunction with his ſon; and for this latter favour, we may perhaps, be conſidered as under more obligation to them than for the former, the microſcope having more various and extenſive uſes, with reſpect to philoſophy, than the teleſcope. In our ideas, however, it appears ſomething greater, and more extraordinary, to be able to ſee objects too diſtant to be perceived by the naked eye; than thoſe that are too near to be ſeen by us; and therefore there is more of the ſublime in the teleſcope than the microſcope. Theſe two inſtruments, though different in their application, are notwithſtanding very ſimilar; as both of them aſſiſt us in the diſcovery of objects that we muſt otherwiſe have remained unacquainted with, by enlarging the angle which they ſubtend at the eye.

The Janſens, however, have not always enjoyed, undiſturbed, that ſhare of reputation to which they ſeem to be entitled, with reſpect either to the teleſcope or the microſcope. The diſcovery of the latter, in particular, has generally been conſidered as more uncertain than that of the former. All that many writers ſay we can depend upon is, that microſcopes were firſt uſed in Germany about the year 1621. Others ſay poſitively, that this inſtrument was the contrivance of Cornelius

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(D) This paragraph is extracted from this paper in the Tranſactions; but Dollond's improvement there deſcribed is not accompanied by any diagram. For a minute account of it, and of eye-pieces in general, ſee *Ludlam's Eſſays*

Cornelius Drebell, no philoſopher, but a man of curioſity and ingenuity, who alſo invented the thermometer.

According to Borellus, Zacharias Janſen and his ſon preſented the firſt microſcopes they had conſtructed to Prince Maurice, and Albert archduke of Auſtria. William Borell, who gives this account in a letter, to his brother Peter, ſays, that when he was ambaſſador in England, in 1619, Cornelius Drebell, with whom he was intimately acquainted, ſhowed him a microſcope, which he ſaid was the ſame the archduke had given him, and had been made by Janſen himſelf. This inſtrument was not ſo ſhort as they are generally made at preſent, but was ſix feet long, conſiſting of a tube of gilt copper, an inch in diameter, ſupported by three braſs pillars in the ſhape of dolphins, on a baſe of ebony, on which the ſmall objects were placed.

106 Microſcope made by Janſen.

This microſcope was evidently a compound one, or rather ſomething betwixt a teleſcope and a microſcope, what we ſhould now, perhaps chooſe to call a *megaloſcope*; ſo that it is poſſible that ſingle microſcopes might have been known, and in uſe, ſome time before; but perhaps nobody thought of giving that name to ſingle lenſes, though, from the firſt uſe of lenſes, they could not but have been uſed for the purpoſe of magnifying ſmall objects. In this ſenſe we have ſeen, that even the ancients were in poſſeſſion of microſcopes; and it appears from Jamblicus and Plutarch, quoted by Dr Rogers, that they gave ſuch inſtruments as they uſed for this purpoſe the name of *dioptra*. As ſpectacles were certainly in uſe long before the invention of teleſcopes, one can hardly help concluding, that lenſes muſt have been made ſmaller, and more convex, for the purpoſe of magnifying minute objects; eſpecially as the application of this kind of microſcope was nearly the ſame with that of a ſpectacle glaſs, both of them being held cloſe to the eye. At what time lenſes were made ſo ſmall as we now generally uſe them for magnifying in ſingle microſcopes, we have not found. But as this muſt neceſſarily have been done gradually, the only proper object of inquiry is the invention of the double or compound microſcope; and this is clearly given, by the evidence of Borellus above-mentioned, to Zacharias Janſen the inventor of the teleſcope, or his ſon.

The invention of compound microſcopes is claimed by the ſame Fontana who claimed the diſcovery of teleſcopes; and though he did not publiſh any account of this invention till the year 1646 (notwithſtanding he pretended to have made the diſcovery in 1618), Montucla, not having attended perhaps to the teſtimony of Borellus, is willing to allow his claim, as he thought there was no other perſon who ſeemed to have any better right to it.

107 By Divini.

Euſtachio Divini made microſcopes with two common object-glaſſes, and two plano-convex eye-glaſſes joined together on their convex ſides ſo as to meet in a point. The tube in which they were encloſed was as big as a man's leg, and the eye-glaſſes almoſt as broad as the palm of a man's hand. Mr Oldenburg, ſecretary to the Royal Society, received an account of this inſtrument from Rome, and read it at one of their meetings, Auguſt 6. 1668.

108 By Hartſoeker.

It was in this period that Hartſoeker improved ſingle microſcopes, by uſing ſmall globules of glaſs, made by melting them in the flame of a candle, inſtead of the lenſes which had before been made uſe of for that purpoſe. By this means he firſt diſcovered the *animalcula in ſemine maſculino*, which gave riſe to a new ſyſtem of generation. A microſcope of this kind, conſiſting of a globule of an inch $\frac{1}{10}$ in diameter, M. Huygens demonſtrated to magnify 100 times; and ſince it is eaſy to make them of leſs than half a line in diameter, they may be made to magnify 300 times. Were it not for the difficulty of applying objects to theſe magnifiers, the want of light, and the ſmall field of diſtinct viſion, they would certainly have been the moſt perfect of all microſcopes.

109 By Leeuwenhoek.

But no man diſtinguiſhed himſelf ſo much by microſcopical diſcoveries as the famous M. Leeuwenhoek, though he uſed only ſingle lenſes with ſhort foci, preferring diſtinctneſs of viſion to a large magnifying power.

M. Leeuwenhoek's microſcopes were all ſingle ones, each of them conſiſting of a ſmall double convex glaſs, ſet in a ſocket between two ſilver plates rivetted together, and pierced with a ſmall hole; and the object was placed on the point of a needle, ſo contrived as to be placed at any diſtance from the lens. If the objects were ſolid, he faſtened them with glue; and if they were fluid, or on other accounts required to be ſpread upon glaſs, he placed them on a ſmall piece of Muſcovy talc, or glaſs blown very thin; which he afterwards glued to his needle. He had, however, a different apparatus for viewing the circulation of the blood, which he could fix to the ſame microſcopes.

The greateſt part of his microſcopes M. Leeuwenhoek bequeathed to the Royal Society. They were contained in a ſmall Indian cabinet, in the drawers of which were 13 little boxes, or caſes, in each of which were two microſcopes, neatly fitted up in ſilver; and both the glaſs and the apparatus were made with his own hands.

The glaſs of all theſe lenſes is exceedingly clear, but none of them magnifies ſo much as thoſe globules which are frequently uſed in other microſcopes; but Mr Folkes, who examined them, thought that they ſhowed objects with much greater diſtinctneſs, which M. Leeuwenhoek principally valued. His diſcoveries, however, are to be aſcribed not ſo much to the goodneſs of his glaſſes, as to his great judgment, acquired by long experience, in uſing them. He alſo particularly excelled in his manner of preparing objects for being viewed to the moſt advantage.

Mr Baker, who alſo examined M. Leeuwenhoek's microſcopes, and made a report concerning them to the Royal Society, found that the greateſt magnifier among them enlarged the diameter of an object about 160 times, but that all the reſt fell much ſhort of that power; ſo he concluded that M. Leeuwenhoek muſt have had other microſcopes of a much greater magnifying power for many of his diſcoveries. And it appears, he ſays, by many circumſtances, that he had ſuch microſcopes.

It appears from M. Leeuwenhoek's writings, that he was not unacquainted with the method of viewing opaque objects by means of a ſmall concave reflecting mirror, which was afterwards improved by M. Lieberkuhn. For, after deſcribing his apparatus for viewing eels in glaſs tubes, he adds, that he had an inſtrument to which he ſcrewed a microſcope ſet in braſs, upon which microſcope he faſtened a little diſh of braſs, probably that his eye might be thereby aſſiſted to ſee objects better; for he ſays he had filed the braſs which was round his microſcope as bright as he could, that the light, while he was viewing objects, might be reflected from it as much as poſſible. This microſcope, with its diſh, is conſtructed upon principles ſo ſimilar to thoſe which are the foundation of our ſingle microſcope by reflection (ſee Microscope), that it may well be ſuppoſed to have given the hint to the ingenious inventor of it, provided he ever attended to it.

110 Wilſon's microſcope.

In 1702, Mr Wilſon made ſeveral ingenious improvements in the method of uſing ſingle magnifiers, for the purpoſe of viewing tranſparent objects; and his microſcope, which is alſo a neceſſary part of the ſolar microſcope, is in very general uſe at this day. (See Microscope, ſect. 1.)

111 Adams's method of making globules for large magnifiers.

In 1710, Mr Adams gave to the Royal Society the following account of his method of making ſmall globules for large magnifiers. He took a piece of fine window-glaſs, and cut it with a diamond into as many lengths as he thought proper, not exceeding $\frac{1}{8}$ of an inch in breadth; then, holding one of them between the fore-finger and thumb of each hand over a very fine flame, till the glaſs began to ſoften, he drew it out till it was as fine as a hair, and broke; then putting each of the ends into the pureſt part of the flame, he had two globules preſently, which he could make larger or leſs at pleaſure. If they were held a long time in the flame, they would have ſpots in them, ſo that he drew them out preſently after they became round. The ſtem he broke off as near to the globule as he could, and lodging the remainder between the plates, in which holes were drilled exactly round, the microſcope, he ſays, performed to admiration. Through theſe magnifiers, he ſays, that the ſame thread of very fine muſlin appeared three or four times bigger than it did in the largeſt of Mr Wilſon's magnifiers.

112 Temporary microſcopes by Mr Grey.

The ingenious Mr Grey hit upon a very eaſy expedient to make very good temporary microſcopes, at a very little expence. They conſiſt of nothing but very ſmall drops of water, taken up with the point of a pin, and put into a ſmall hole made in a piece of metal. Thoſe globules of water, do not, indeed, magnify ſo much as thoſe which are made of glaſs of the ſame ſize, becauſe the refractive power of water is not ſo great; but the ſame purpoſe will be anſwered nearly as well by making them ſomewhat ſmaller.

The ſame ingenious perſon, obſerving that ſmall heterogeneous particles encloſed in the glaſs of which microſcopes are made, were much magnified when thoſe glaſſes were looked through, thought of making his microſcopes of water that contained living animalcula, to ſee how they would look in this new ſituation; and he found his ſcheme to anſwer even beyond his utmoſt expectation, ſo that he could not even account for their being magnified ſo much as they were: for it was much more than they would have been magnified if they had been placed beyond the globule, in the proper place for viewing objects. But Montucla obſerves, that, when any object is encloſed within this ſmall tranſparent globule, the hinder part of it acts like a concave mirror, provided they be ſituated between that ſurface and the focus; and that, by this means, they are magnified above $3\frac{1}{2}$ times more than they would have been in the uſual way.

113 Dr Barker's reflecting microſcope.

After the happy execution of the reflecting teleſcope, it was natural to expect that attempts would alſo be made to render a ſimilar ſervice to microſcopes. Accordingly we find two plans of this kind. The firſt was that of Dr Robert Barker. His inſtrument differs in nothing from the reflecting teleſcope, excepting the diſtance of the two ſpeculums, in order to adapt it to thoſe pencils of rays which enter the microſcope diverging; whereas they come to the teleſcope from very diſtant objects nearly parallel to each other.

This microſcope is not ſo eaſy to manage as the common ſort. For viſion by reflection, as it is much more perfect, ſo it is far more difficult than that by refraction. Nor is this microſcope ſo uſeful for any but very ſmall or tranſparent objects. For the object, being between the ſpeculum and image, would, if it were large and opaque, prevent a due reflection.

114 Dr Smith's reflecting microſcope ſuperior to all others.

Dr Smith invented a double reflecting microſcope, of which a theoretical and practical account is given in the remarks on the ſecond volume of his Syſtem of Optics. Through ſome of thoſe incidents to which the conducting of a work ſo multifarious as ours is always liable, this inſtrument was omitted under the article Microscope. As it is conſtructed on principles eſſentially different from all others, and, in the opinion of the ableſt judges whom we have conſulted, incomparably ſuperior to them all, the reader will not be ill pleaſed with the following practical deſcription, though it appears not perhaps in its moſt proper place.

Plate CCCLIV.

Fig. 2. is a ſection of this microſcope, where ABC and *abc* are two ſpecula, the former concave, and the latter convex, encloſed within the tube DEFG. The ſpeculum ABC, is perforated like the ſpeculum of a Gregorian teleſcope; and the object to be magnified is ſo placed between the centre and principal focus of that ſpeculum, that the rays flowing from it to ABC are reflected towards an image *pq*. But before they are united in that image they are received by the convex ſpeculum *abc*, and thence reflected through the hole BC in the vertex of the concave to a ſecond image $\pi\kappa$, to be viewed through an eye-glaſs *l*. The object may either be ſituated between the two ſpecula, or, which is perhaps better, between the principal focus and vertex *c* of the convex ſpeculum *abc*, a ſmall hole being made in its vertex for the incident rays to paſs through. When the microſcope is uſed, let the object be included between two little round plates of Muſcovy glaſs, fixed in a hole of an oblong braſs plate *mn*, intended to ſlide cloſe to the back ſide of the convex ſpeculum: which muſt therefore be ground flat on that ſide, and ſo thin that the object may come preciſely to its computed diſtance from the vertex of the ſpeculum. The ſlider muſt be kept tight to the back of the metal by a gentle ſpring. The diſtance of the object being thus determined once for all, diſtinct viſion to different eyes, and through different eye-glaſſes, muſt be procured by a gentle motion of the little tubes that contain theſe glaſſes. Theſe tubes muſt be made in the uſual form of thoſe that belong to Sir Iſaac Newton's reflecting teleſcope, (ſee Telescope), having a ſmall hole in the middle of each plate, at the ends of the tube, ſituated exactly in each focus of the glaſs; the uſe of theſe holes and plates is to limit the viſible area, and hinder any ſtraggling rays from entering the eye. To the tube of the eye-glaſs is faſtened the arm *g*, on which the adjuſting ſcrew turns. A ſimilar arm *u* is attached to the fixed tube X, in which the neck of the ſcrew turns; and by turning the button *y*, the eye tube is moved farther from or nearer to the object, by which means different ſorts of eyes obtain diſtinct viſion.

The rays which flow from the object directly through the hole in the concave ſpeculum and through the eye-glaſs, by mixing with the reflected rays, would dilute the image on the retina, and therefore muſt be intercepted. This is done by a very ſimple contrivance. The little hole in the convex ſpeculum is ground conical as in the figure; and a conical ſolid P, of which the baſe is larger than the orifice in the back of the convex ſpeculum, ſupported on the ſlender pillar PQ, is ſo placed as to intercept all the *direct rays*, from the eye-glaſs. All the tubes are ſtrongly blacked on their inſides, and ſo is the conical ſolid, to hinder all reflection of rays from theſe objects upon the convex ſpeculum. The little baſe [illegible], of the ſolid ſhould be made concave, that whatever light it may ſtill reflect, may be thrown back upon the object; and its backſide being conical and blacked all over, will either abſorb or laterally diſperſe any ſtraggling rays which the concave ſpeculum may ſcatter upon it, and ſo prevent their coming to the eye-glaſs.

Notwithſtanding the interpoſition of this conical ſolid, yet when the eye-glaſs is taken out, diſtant objects may be diſtinctly ſeen through the microſcope, by rays reflected from the metals, and diverging upon the eye from an image behind the convex ſpeculum. But this mixture of foreign rays with thoſe of the object, which is common to all kinds of microſcopes in viewing tranſparent objects, is uſually prevented by placing before the object a thick double convex lens L, to collect the ſky light exactly from the object. This lens ſhould be juſt ſo broad as to ſubtend the oppoſite angle to that which the concave ſpeculum ſubtends at the object. The annular frame of the lens muſt be very narrow, and connected to the microſcope by two or three ſlender wires or blades, whoſe planes produced may paſs through the object, and intercept from it as little ſky light as poſſible.

This is not the place for explaining the principles of this microſcope, or demonſtrating its ſuperiority over moſt others; nor are ſuch explanation and demonſtration neceſſary. Its excellence, as well as the principles upon which it is conſtructed, will be perceived by the reader, when he has made himſelf maſter of the laws of refraction and reflection as laid down in the enſuing part of this article.

115
Solar microſcope, and that for opaque objects.

In 1738 or 1739, M. Lieberkuhn made two capital improvements in microſcopes, by the invention of the *ſolar microſcope*, and the *microſcope for opaque objects*. When he was in England in the winter of 1739, he ſhowed an apparatus of his own making, for each of theſe purpoſes, to ſeveral gentlemen of the Royal Society, as well as to ſome opticians, particularly Mr Cuff in Fleet-ſtreet, who took great pains to improve them.

The microſcope for opaque objects remedies the inconvenience of having the dark ſide of an object next the eye. For by means of a concave ſpeculum of ſilver, highly poliſhed, in the centre of which a magnifying lens is placed, the object is ſo ſtrongly illuminated that it may be examined with all imaginable eaſe and pleaſure. A convenient apparatus of this kind, with four different ſpeculums and magnifiers of different powers, was brought to perfection by Mr Cuff.

M. Lieberkuhn made conſiderable improvements in his ſolar microſcope, particularly in adapting it to the view of opaque objects; but in what manner this end was effected, M. Æpinus, who was highly entertained with the performance, and who mentions the fact, was not able to recollect; and the death of the ingenious inventor prevented his publiſhing any account of it himſelf. M. Æpinus invites thoſe perſons who came into the poſſeſſion of M. Lieberkuhn's apparatus to publiſh an account of this inſtrument; but it doth not appear that his method was ever publiſhed.

This improvement of M. Lieberkuhn's induced M. Æpinus himſelf to attend to the ſubject; and by this means he produced a very valuable improvement in this inſtrument. For by throwing the light upon the foreſide of any object by means of a mirror, before it is tranſmitted through the object lens, all kinds of objects are equally well repreſented by it.

116
Reflected light introduced into the microſcope and magic lantern.

M. Euler propoſed a ſcheme to introduce viſion by reflected light into the magic lantern and ſolar microſcope, by which many inconveniences to which thoſe inſtruments are ſubject might be avoided. For this purpoſe, he ſays, that nothing is neceſſary but a large concave mirror, perforated as for a teleſcope; and that the light be ſo ſituated, that none of it may paſs directly through the perforation, ſo as to fall on the images of the objects upon the ſcreen. He propoſes to have four different machines, for objects of different ſizes; the firſt for thoſe of ſix feet long, the ſecond for thoſe of one foot, the third for thoſe of two inches, and the fourth for thoſe of two lines; but it is needleſs to be particular in the deſcription of theſe, as more perfect inſtruments are deſcribed under the article MICROSCOPE.

Several improvements were made in the apparatus to the ſolar microſcope, as adapted to view opaque objects, by M. Zeiher, who made one conſtruction for the larger kind of objects, and another for the ſmall ones.

117
Mr Martin's improvement in the ſolar microſcope.

Mr Martin having conſtructed a ſolar microſcope of a larger ſize than common, for his own uſe, the illuminating lens being 4½ inches in diameter, and all the other parts of the inſtrument in proportion, found, that by the help of an additional part, which he does not deſcribe, he could ſee even opaque objects very well. If he had made the lens any larger, he was aware that the heat produced at the focus would have been too great for the generality of objects to bear. The expence of this inſtrument, he ſays, does not much exceed the price of the common ſolar microſcope.

118
Di Torre's extraordinary magnifying microſcope.

The ſmalleſt globules, and conſequently the greateſt magnifiers, for microſcopes, that have yet been executed, were made by T. Di Torre of Naples, who, in 1765, ſent four of them to the Royal Society. The largeſt of them was only two Paris points in diameter, and it was ſaid to magnify the diameter of an object 640 times. The ſecond was the ſize of one Paris point, and

119 Could not be uſed by Mr Baker.

and the third was no more than half of a Paris point, or the 144th part of an inch in diameter, and was ſaid to magnify the diameter of an object 2560 times. One of theſe globules was wanting when they came into the hands of Mr Baker, to whoſe examination they were referred by the Royal Society. This gentleman, ſo famous for his ſkill in microſcopes, and his extraordinary expertneſs in managing them, was not able to make any uſe of theſe. With that which magnifies the leaſt, he was not able to ſee any object with ſatisfaction; and he concludes his account with expreſſing his hopes only, that, as his eyes had been much uſed to microſcopes, they were not injured by the attention he had given to them, though he believed there were few perſons who would not have been blinded by it.

The conſtruction of a teleſcope with ſix eye-glaſſes led M. Euler to a ſimilar conſtruction of microſcopes, by introducing into them ſix lenſes, one of which admits of ſo ſmall an aperture, as to ſerve, inſtead of a diaphragm, to exclude all foreign light, though, as he ſays, it neither leſſens the field of view, nor the brightneſs of objects.

120 Difficulties attending the conſtruction of dioptric inſtruments.

The improvement of all dioptric inſtruments is greatly impeded by inequalities in the ſubſtance of the glaſs of which they are made; but though many attempts have been made to make glaſs without that imperfection, none of them have been hitherto quite effectual. M. A. D. Merklein, having found ſome glaſs which had been melted when a building was on fire, and which proved to make excellent object-glaſſes for teleſcopes, concluded that its peculiar goodneſs aroſe from its not having been diſturbed when it was in a fluid ſtate; and therefore he propoſed to take the metal out of the furnace in iron veſſels, of the ſame form that was wanted for the glaſs; and after it had been perfectly fluid in thoſe veſſels, to let it ſtand to cool, without any diſturbance. But this is not always found to anſwer.

PART I. THEORY OF OPTICS.

THIS part of the ſcience contains all that hath been diſcovered concerning the various motions of the rays of light, either through different mediums, or when reflected from different ſubſtances in the ſame medium. It contains alſo the *rationale* of every thing which hath been diſcovered with regard to viſion; the optical deceptions to which we are liable; and, in ſhort, ought to give the reaſon of all the known optical phenomena.—The ſcience is commonly divided into three parts, viz. Dioptrics, which contain the laws of refraction, and the phenomena depending upon them; Catoptrics, which contain the laws of reflection, and the phenomena which depend on them; and, laſtly, Chromatics, which treat of the phenomena of colour. But this definition is of no uſe in a treatiſe of Optics, as moſt of the phenomena depend both on refraction and reflection, colour itſelf not excepted. For this reaſon, though we have given detached articles under the words DIOPTRICS, CATOPTRICS, and CHROMATICS; we have reſerved to this place the explanation of the laws of reflection and refraction, by which all optical phenomena may be accounted for.

SECT. I. *Of the properties of Light in general.*

121 Different opinions concerning the nature of light.

UNDER the article LIGHT we have given ſome account of the controverſies concerning its nature. The opinions of philoſophers may, in general, be arranged under theſe two: 1. That the phenomena of viſion and illumination are produced by the undulations of an elaſtic fluid, much in the ſame manner as ſound is produced by the undulations of air. This opinion was firſt offered to the public by Deſcartes, and afterwards by Mr Huygens, and has lately been revived by M. Euler, who has endeavoured to explain the phenomena upon mechanical principles.—2. That the phenomena of viſion are produced by the motion and action of matter emitted from the ſhining body with immenſe velocity, moving uniformly in ſtraight lines, and acted on by other bodies; ſo as to be reflected, refracted, or inflected, in various ways, by means of forces which act on it in the ſame manner as on other inert matter. Sir Iſaac Newton has ſhown, in the moſt incontrovertible manner, the total diſſimilarity between the phenomena of viſion and the legitimate conſequences of the undulations of an elaſtic fluid. All M. Euler's ingenious and laborious diſcuſſions have not removed Newton's objections in the ſmalleſt degree. Sir Iſaac adopts the vulgar opinion, therefore, making light of the difficulties objected to it, becauſe none of them are inconſiſtent with the eſtabliſhed principles of mechanics, and are merely difficulties of conception to limited faculties like ours. We need not deſpair of being able to decide, by experiment, which of theſe opinions is neareſt to the truth; becauſe there are phenomena where the reſult ſhould be ſenſibly different in the two hypotheſes. At preſent, we ſhall content ourſelves with giving ſome account of the legitimate conſequences of the vulgar opinion as modified by Sir Iſaac Newton, viz. that light conſiſts of ſmall particles emitted with very great velocity, and attracted or repelled by other bodies at very ſmall diſtances.

122 Light iſſues in ſtraight lines from each point in a luminous ſurface.

Every viſible body emits or reflects inconceivably ſmall particles of matter from each point of its ſurface, which iſſue from it continually (not unlike ſparks from a coal) in ſtraight lines and in all directions. Theſe particles entering the eye, and ſtriking upon the retina, (a nerve expanded on the back part of the eye to receive their impulſes), excite in our minds the idea of light. And as they differ in ſubſtance, denſity, velocity, or magnitude, they produce in us the ideas of different colours; as will be explained in its proper place.

That the particles which conſtitute light are exceedingly ſmall, appears from hence, viz. that if a hole be made through a piece of paper with a needle, rays of light from every object on the farther ſide of it are capable of paſſing through it at once without the leaſt confuſion; for any one of thoſe objects may as clearly be ſeen through it, as if no rays paſſed through it from any of the reſt. Further, If a candle is lighted, and there be no obſtacle in the way to obſtruct the progreſs of its rays, it will fill all the ſpace within two miles of it every way with luminous particles, before it has loſt the leaſt ſenſible part of its ſubſtance thereby.

That theſe particles proceed from every point of the ſurface of a viſible body, and in all directions, is clear from hence, *viz.* becauſe wherever a ſpectator is placed with regard to the body, every point of that part of the ſurface which is turned towards him is viſible to him. That they proceed from the body in right lines, we are aſſured, becauſe juſt ſo many and no more will be intercepted in their paſſage to any place by an interpoſed object, as that object ought to intercept, ſuppoſing them to come in ſuch lines.

The velocity with which they proceed from the ſurface of the viſible body is no leſs ſurpriſing than their minuteneſs; the method whereby philoſophers eſtimate their ſwiftneſs, is by obſervations made on the eclipſes of Jupiter's ſatellites; which eclipſes appear to us about ſeven minutes ſooner than they ought to do by calculation, when the earth is placed between the ſun and him, that is, when we are neareſt to him; and as much later, when the ſun is between him and us, at which time we are fartheſt from him; from whence it is concluded, that they require about ſeven minutes to paſs over a ſpace equal to the diſtance between the ſun and us, which is about 95,000,000 of miles.

A ſtream of theſe particles iſſuing from the ſurface of a viſible body in one and the ſame direction, is called a *ray of light*.

As rays proceed from a viſible body in all directions, they neceſſarily become thinner and thinner, continually ſpreading themſelves as they paſs along into a larger ſpace, and that in proportion to the ſquares of their diſtances from the body; that is, at the diſtance of two ſpaces, they are four times thinner than they are at one; at the diſtance of three ſpaces, nine times thinner, and ſo on; the reaſon of which is, becauſe they ſpread themſelves in a twofold manner, *viz.* upwards and downwards, as well as ſidewiſe.

The particles of light are ſubject to the laws of attraction of coheſion, like other ſmall bodies; for if a ray of light be made to paſs by the edge of a knife, it will be diverted from its natural courſe, and be inflected towards the edge of the knife. The like inflection happens to a ray when it enters obliquely into a denſer or rarer ſubſtance than that in which it was before, in which caſe it is ſaid to be refracted; the laws of which refraction are the ſubject of the following ſection.

Sect. II. *Of Refraction.*

123
Refraction defined.

Light, when proceeding from a luminous body, without being reflected from any opaque ſubſtance, or inflected by paſſing very near one, is invariably found to proceed in ſtraight lines, without the leaſt deviation. But if it happens to paſs obliquely from one medium to another, it always leaves the direction it had before, and aſſumes a new one; and this change of courſe is called its *refraction*. After having taken this new direction, it then proceeds invariably in a ſtraight line till it meets with a different medium, when it is again turned out of its courſe. It muſt be obſerved, however, that though by this means we may cauſe the rays of light make any number of angles in their courſe, it is impoſſible for us to make them deſcribe a curve, except in one ſingle caſe, namely, where they paſs through a medium, the denſity of which uniformly either increaſes or decreaſes. This is the caſe with the light of the celeſtial bodies, which paſſes downwards through our atmoſphere, and likewiſe with that which is reflected upwards through it by terreſtrial objects. In both theſe caſes, it deſcribes a curve of the hyperbolic kind; but at all other times it proceeds in ſtraight lines, or in what may be taken for ſtraight lines without any ſenſible error.

124
In what caſe the rays of light deſcribe a curve.

§ 1. *The cauſe of Refraction, and the law by which it is performed.*

125
Phenomena of refraction ſolved by an attractive power in the medium.

The phenomena of refraction are explained by an attractive power in the medium through which light paſſes, in the following manner: All bodies being endowed with an attractive force, which is extended to ſome diſtance beyond their ſurfaces; when a ray of light paſſes out of a rarer into a denſer medium (if this latter has a greater attractive force than the former, as is commonly the caſe), the ray, juſt before its entrance, will begin to be attracted towards the denſer medium; and this attraction will continue to act upon it, till ſome time after it has entered the medium; and therefore, if a ray approaches a denſer medium in a direction perpendicular to its ſurface, its velocity will be continually accelerated during its paſſage through the ſpace in which that attraction exerts itſelf; and therefore, after it has paſſed that ſpace, it will move on, till it arrives at the oppoſite ſide of the medium, with a greater degree of velocity than it had before it entered. So that in this caſe its velocity only will be altered. Whereas, if a ray enters a denſer medium obliquely, it will not only have its velocity augmented thereby, but its direction will become leſs oblique to the ſurface. Juſt as when a ſtone is thrown downwards obliquely from a precipice, it falls to the ſurface of the ground in a direction nearer to a perpendicular one, than that with which it was thrown from the hand. From hence we ſee a ray of light, in paſſing out of a rarer into a denſer medium, is refracted towards the perpendicular; that is, ſuppoſing a line drawn perpendicularly to the ſurface of the medium, through the point where the ray enters, and extended both ways, the ray in paſſing through the ſurface is refracted or bent towards the perpendicular line; or, which is the ſame thing, the line which it deſcribes by its motion after it has paſſed through the ſurface, makes a leſs angle with the perpendicular, than the line it deſcribed before. All which may be illuſtrated in the following manner.

Plate CCCLIV.

Let us ſuppoſe firſt, that the ray paſſes out of a vacuum into the denſer medium ABCD (fig. 3.), and that the attractive force of each particle in the medium is extended from its reſpective centre to a diſtance equal to that which is between the lines AB and EF, or AB and GH; and let KL be the path deſcribed by a ray of light in its progreſs towards the denſer medium. This ray, when it arrives at L, will enter the attractive forces of thoſe particles which lie in AB the ſurface of the denſer medium, and will therefore ceaſe to proceed any longer in the right line KLM, but will be diverted from its courſe by being attracted towards the

Cauſe of Refraction.

the line AB, and will begin to deſcribe the curve LN paſſing through the ſurface AB in ſome new direction, as OQ; thereby making a leſs angle with a line, as PR, drawn perpendicularly through the point N, than it would have done had it proceeded in its firſt direction KLM.

Farther: Whereas, we have ſuppoſed the attractive force of each particle to be extended through a ſpace equal to the diſtance between AB and EF, it is evident that the ray, after it has entered the ſurface, will ſtill be attracted downwards, till it has arrived at the line EF; for, till that time, there will not be ſo many particles above it which will attract it upwards, as below, that will attract it downwards. So that after it has entered the ſurface at N, in the direction OQ, it will not proceed in that direction, but will continue to deſcribe a curve, as NS; after which it will proceed ſtraight on towards the oppoſite ſide of the medium, being attracted equally every way; and therefore will at laſt proceed in the direction XST, ſtill nearer the perpendicular PR than before.

Now if we ſuppoſe ABZY not to be a vacuum, but a rarer medium than the other, the caſe will ſtill be the ſame; but the ray will not be ſo much refracted from its rectilineal courſe, becauſe the attraction of the particles of the upper medium being in a contrary direction to that of the attraction of thoſe in the lower one, the attraction of the denſer medium will in ſome meaſure be deſtroyed by that of the rarer.

On the contrary, when a ray paſſes out of a denſer into a rarer medium, if its direction be perpendicular to the ſurface of the medium, it will only loſe ſomewhat of its velocity, in paſſing through the ſpaces of attraction of that medium (that is, the ſpace wherein it is attracted more one way than it is another). If its direction be oblique, it will continually recede from the perpendicular during its paſſage, and by that means have its obliquity increaſed, juſt as a ſtone thrown up obliquely from the ſurface of the earth increaſes its obliquity all the time it riſes. Thus, ſuppoſing the ray TS paſſing out of the denſer medium ABCD into the rarer ABZY, when it arrives at S it will begin to be attracted downwards, and ſo will deſcribe the curve SNL, and then proceed in the right line LK; making a larger angle with the perpendicular PR, than the line TSX in which it proceeded during its paſſage through the other medium.

We may here make a general obſervation on the forces which produce this deviation of the rays of light from their original path. They ariſe from the joint action of all the particles of the body which are ſufficiently near the particle of light; that is, whoſe diſtance from it is not greater than the line AE or GA; and therefore the whole force which acts on a particle in its different ſituations between the planes GH and EF, follows a very different law from the force exerted by one particle of the medium.

The ſpace through which the attraction of coheſion of the particles of matter is extended is ſo very ſmall, that in conſidering the progreſs of a ray of light out of one medium into another, the curvature it deſcribes in paſſing through the ſpace of attraction is generally neglected; and its path is ſuppoſed to be bent, or, in the uſual terms, the ray is ſuppoſed to be refracted only in the point where it enters the denſer medium.

Cauſe of Refraction.

Now the line which a ray deſcribes before it enters a denſer or a rarer medium, is called the *incident ray*: that which it deſcribes after it has entered, is the *refracted ray*.

The angle comprehended between the incident ray and the perpendicular, is the *angle of incidence*; and that between the refracted ray and the perpendicular, is the *angle of refraction*.

There is a certain and immutable law or rule, by which refraction is always performed; and that is this: Whatever inclination a ray of light has to the ſurface of any medium before it enters it, the degree of refraction will always be ſuch, that the proportion between the ſine of the angle of its incidence, and that of the angle of its refraction, will always be the ſame in that medium.

Plate CCCLIV.

To illuſtrate this: Let us ſuppoſe ABCD (fig. 4.) to repreſent a rarer, and ABEF a denſer medium: let GH be a ray of light paſſing through the firſt and entering the ſecond at H, and let HI be the refracted ray: then ſuppoſing the perpendicular PR drawn through the point H, on the centre H, and with any radius, deſcribe the circle APBR; and from G and I, where the incident and refracted rays cut the circle, let fall the lines GK and IL, perpendicularly upon the line PR; the former of theſe will be the ſine of the angle of incidence, the latter of refraction. Now if in this caſe the ray GH is ſo refracted at H, that GK is double or triple, &c. of IL, then, whatever other inclination the ray GH might have had, the ſine of its angle of incidence would have been double or triple, &c. to that of its angle of refraction. For inſtance, had the ray paſſed in the line MH before refraction, it would have paſſed in ſome line as HN afterwards, ſo ſituated that MO ſhould have been double or triple, &c. of NQ.

When a ray paſſes out of a vacuum into air, the ſine of the angle of incidence is found to be to that of refraction as 100036 to 100000.

When it paſſes out of air into water, as about 4 to 3.

When out of air into glaſs, as about 17 to 11.

When out of air into a diamond, as about 5 to 2.

This relation of the ſine of the angle of incidence to that of refraction, which is a propoſition of the moſt extenſive uſe in explaining the optical phenomena on phyſical or mechanical principles, may be demonſtrated in the following eaſy and familiar manner.

Lemma I. The augmentations or diminutions of the ſquares of the velocities produced by the uniform action of accelerating or retarding forces, are proportional to the forces, and to the ſpaces along which they act, jointly, or are proportional to the products of the forces multiplied by the ſpaces.

Let two bodies be uniformly accelerated from a ſtate of reſt in the points A *a*, along the ſpaces AB, *a b*, fig. 5. by the accelerated forces F *f*, and let AC, *a c*, be ſpaces deſcribed in equal times; it is evident, from what has been ſaid under the articles Gravity and Acceleration, that becauſe theſe ſpaces are deſcribed with motions uniformly accelerated, AC and *ac* are reſpectively the halves of the ſpaces which would be uniformly deſcribed during the ſame time with the velocities acquired at C and *c*, and are therefore meaſures of theſe velocities. And as theſe velocities are uniformly acquired in equal times, they are meaſures of the accelerating forces. Therefore $AC : ac = F : f$. Alſo, from the nature of uniformly accelerated motion, the ſpaces are proportional to the ſquares of the acquired velocities. Therefore, (uſing the ſymbols $\surd^2 C$, $\surd^2 c$, &c. to expreſs the ſquares of the velocities at $C\,c$, &c.) we have

$$\surd^2 B : \surd^2 C = AB : AC$$
$$\surd^2 C : \surd^2 c = AC^2 : ac^2$$
$$\surd^2 c : \surd^2 b = ac : ab$$

Therefore, by equality of compound ratios

$$\surd^2 B : \surd^2 b = AB \times AC : ab \times ac, = AB \times F : ab \times f.$$

And in like manner $\surd^2 D : \surd^2 d = AD \times F : ad \times f$; and $\surd^2 B - \surd^2 D : \surd^2 b - \surd^2 d = BD \times F : bd \times f$. Q. E. D.

Corol. If the forces are as the ſpaces inverſely, the augmentations or diminutions of the ſquares of the velocities are equal.

Remark. If DB, *db*, be taken extremely ſmall, the products $BD \times F$ and $bd \times f$ may be called the momentary actions of the forces, or the momentary increments of the ſquares of the velocities. It is uſually expreſſed, by the writers on the higher mechanics, by the ſymbol $f\dot{s}$, or fds, where f means the accelerating force, and $\dot{s}$ or ds means the indefinitely ſmall ſpace along which it is uniformly exerted. And the propoſition is expreſſed by the fluxionary equation $f\dot{s} = v\dot{v}$, becauſe $v\dot{v}$ is half the increment of v^2, as is well known.

Plate CCCLIV. fig. 6. *Lemma* 2. (being the 39th propoſition of the firſt book of Newton's Principia.) If a particle of matter, moving with any velocity along the line AC, be impelled by an accelerating or retarding force, acting in the ſame or in the oppoſite direction, and if the intenſity of the force in the different points B, F, H, C, &c. be as the ordinates BD, FG, &c. to the line DGE, the areas BFGD, BHKD, &c. will be as the changes made on the ſquare of the velocity at B, when the particle arrives at the points F, H, &c.

For let BC be divided into innumerable ſmall portions, of which let FH be one, and let the force be ſuppoſed to act uniformly, or to be of invariable intenſity during the motion along FH; draw GI perpendicular to HK: It is evident that the rectangle FHIG will be as the product of the accelerating force by the ſpace along which it acts, and will therefore expreſs the momentary increment of the ſquare of the velocity. (Lemma 1.) The ſame may be ſaid of every ſuch rectangle. And if the number of the portions, ſuch as FH, be increaſed, and their magnitude diminiſhed without end, the rectangles will ultimately occupy the whole curvilineal area, and the force will be continually varying in its intenſity. The curvilineal areas will therefore be as the finite changes made on the ſquare of the velocity, and the propoſition is demonſtrated.

Corol. The whole change made on the ſquare of the velocity, is equal to the ſquare of that velocity which the accelerating force would communicate to the particle by impelling it along BC from a ſtate of reſt in B. For the area BCED will ſtill expreſs the ſquare of this velocity, and it equally expreſſes the change made on the ſquare of *any* velocity wherewith the particle may paſs through the point B, and is independent on the magnitude of that velocity.

Remark. The figure is adapted to the caſe where the forces all conſpire with the initial motion of the particle, or all oppoſe it, and the area expreſſes an augmentation or a diminution of the ſquare of the initial velocity. But the reaſoning would have been the ſame, although, in ſome parts of the line BC, the forces had conſpired with the initial motion, and in other parts had oppoſed it. In ſuch a caſe, the ordinates which expreſs the intenſity of the forces muſt lie on different ſides of the abſciſſa BC, and that part of the area which lies on one ſide muſt be conſidered as negative with reſpect to the other, and be ſubtracted from it. Thus, if the forces are repreſented by the ordinates of the dotted curve line DH*e*, which croſſes the abſciſſa in H, the figure will correſpond to the motion of a particle, which, after moving uniformly along AB, is ſubjected to the action of a variable accelerating force during its motion along BH, and the ſquare of its initial velocity is increaſed by the quantity BHD; after which it is retarded during its motion along HC, and the ſquare of its velocity in H is diminiſhed by a quantity HC*e*. Therefore the ſquare of the initial velocity is changed by a quantity BHD—HC*e*, or HC*e*—BHD.

This propoſition is perhaps the moſt important in the whole ſcience of mechanics, being the foundation of every application of mechanical theory to the explanation of natural phenomena. No traces of it are to be found in the writings of philoſophers before the publication of Newton's Principia, although it is aſſumed by John Bernoulli and other detractors from Newton's greatneſs as an elementary truth, without any acknowledgment of their obligations to its author. It is uſually expreſſed by the equation $f\dot{s} = v\dot{v}$ and $\int f\dot{s} = v^2$, *i. e.* the ſum of the momentary actions is equal to the whole or finite increment of the ſquare of the velocity.

PROPOSITION.

126 The ratio of the ſine of incidence to the ſine of refraction.

When light paſſes obliquely into or out of a tranſparent ſubſtance, it is refracted ſo that the ſine of the angle of incidence is to the ſine of the angle of refraction in the conſtant ratio of the velocity of the refracted light to that of the incident light.

Let ST, KR (fig. 7.), repreſent two planes (parallel to, and equidiſtant from, the refracting ſurface XY) which bound the ſpace in which the light, during its paſſage, is acted on by the refracting forces, as explained in N° 125. The intenſity of the refracting forces being ſuppoſed equal at equal diſtances from the bounding planes, though anyhow different at different diſtances from them, may be repreſented by the ordinates T*a*, *nq*, *pr*, *c*R, &c. of the curve *a b n p c*, of which the form muſt be determined from obſervation, and may remain for ever unknown. The phenomena of inflected light ſhow us that it is attracted by the refracting ſubſtance at ſome diſtances, and repelled at others.

Let the light, moving uniformly in the direction AB, enter the refracting ſtratum at B. It will not proceed in that direction, but its path will be incurvated upwards, while acted on by a repulſive force, and downwards, while impelled by an attractive force. It will deſcribe ſome curvilineal path B*do* CDE, which AB touches in B, and will finally emerge from the refracting ſtratum at E, and move uniformly in a ſtraight line EF, which touches the curve in E. If, through *b*, the interſection of the curve of forces with its abſciſſa, we draw *b o*, cutting the path of the light in *o*, it is evident that this path will be concave upwards between B and *o*, and concave downwards between *o* and E. Alſo, if the initial velocity of the light has been ſufficiently ſmall, its path may be ſo much bent upwards, that in ſome point *d* its direction may be parallel to the bounding planes. In this caſe it is evident, that being under the influence of a repulſive force, it will be more bent upwards, and it will deſcribe *d f*, equal and ſimilar to *d* B, and emerge in an angle *g f s*, equal to ABG. In this caſe it is reflected, making the angle of reflection equal to that of incidence. By which it appears how reflection, refraction, and inflection, are produced by the ſame forces and performed by the ſame laws.

But let the velocity be ſuppoſed ſufficiently great to enable the light to penetrate through the refracting ſtratum, and emerge from it in the direction EF; let AB and EF be ſuppoſed to be deſcribed in equal times: They will be proportional to the initial and final velocities of the light. Now, becauſe the refracting forces *muſt* act in a direction perpendicular to the refracting ſurface (ſince they ariſe from the joint action of all the particles of a homogeneous ſubſtance which are within the ſphere of mutual action), they cannot affect the motion of the light eſtimated in the direction of the refracting ſurface. If, therefore, AG be drawn perpendicular to ST, and FK to KR, the lines GB, EK, muſt be equal, becauſe they are the motions AB, EF, eſtimated in the direction of the planes. Draw now EL parallel to AB. It is alſo equal to it. Therefore EL, EF, are as the initial and final velocities of the light. But EF is to EL as the ſine of the angle ELK to the ſine of the angle EFK; that is, as the ſine of the angle ABH to the ſine of the angle FEI; that is, as the ſine of the angle of incidence to the ſine of the angle of refraction.

By the ſame reaſoning it will appear that light, moving in the direction and with the velocity FE, will deſcribe the path EDB, and will emerge in the direction and with the velocity BA.

Let another ray enter the refracting ſtratum perpendicularly at B, and emerge at Q. Take two points N, P, in the line BQ, extremely near to each other, ſo that the refracting forces may be ſuppoſed to act uniformly along the ſpace NP: draw NC, PD, parallel to ST, CM perpendicular to DP, and MO perpendicular to CD, which may be taken for a ſtraight line. Then, becauſe the forces at C and N are equal, by ſuppoſition they may be repreſented by the equal lines CM and NP. The force NP is wholly employed in accelerating the light along NP; but the force CM being tranſverſe to the motion BD, is but partly ſo employed, and may be conceived as ariſing from the joint action of the forces CO, OM, of which CO only is employed in accelerating the motion of the light, while OM is employed in incurvating its path. Now it is evident, from the ſimilarity of the triangles DCM, MCO, that DC : CM=CM : CO, and that $DC \times CO = CM \times CM = NP \times NP$. But $DC \times CO$ and $NP \times NP$ are as the products of the ſpaces by the accelerating forces, and expreſs the momentary increments of the ſquares of the velocities at C and N. (Lemma 1.) Theſe increments, therefore, are equal. And as this muſt be ſaid of every portion of the paths BCE and BNQ, it follows that the whole increment of the ſquare of the initial velocity produced in the motion along BCE, is equal to the increment produced in the motion along BNQ. And, becauſe the initial velocities were equal in both paths, their ſquares were equal. Therefore the ſquares of the final velocities are alſo equal in both paths, and the final velocities themſelves are equal. The initial and final velocities are therefore in a conſtant ratio, whatever are the directions; and the ratio of the ſines of the angles of incidence and refraction being the ratio of the velocities of the refracted and incident light, by the former caſe of Prop. 1. is alſo conſtant.

Remark. The augmentation of the ſquare of the initial velocity is equal to the ſquare of the velocity which a particle of light would have acquired, if impelled from a ſtate of reſt at B along the line BQ. (Corol. of the Lemma 2.), and is therefore independent on the initial velocity. As this augmentation is expreſſed by the curvilineal area *a* T *b n p c* R, it depends both on the intenſity of the refracting forces, expreſſed by the ordinates, and on the ſpace through which they act, viz. TR. Theſe circumſtances ariſe from the nature of the tranſparent ſubſtance, and are characteriſtic of that ſubſtance. Therefore, to abbreviate language, we ſhall call this the *ſpecific velocity*.

This ſpecific velocity is eaſily determined for any ſubſtance in which the refraction is obſerved, by drawing L *i* perpendicular to EL, meeting in *i* the circle deſcribed with the radius EF. For E *i* being equal to EF, will repreſent the velocity of the refracted light, and EL repreſent the velocity of the incident light, and $Ei^2 = EL^2 + Li^2$, and therefore Li^2 is the augmentation of the ſquare of the initial velocity, and L *i* is the ſpecific velocity.

It will now be proper to deduce ſome corollaries from theſe propoſitions, tending to explain the chief phenomena of refraction.

127 The motion of light accelerated or retarded by refraction.

1. When light is refracted towards the perpendicular to the refracting ſurface, it is accelerated; and it is retarded when it is refracted from the perpendicular. In the firſt caſe, therefore, it muſt be conſidered as having been acted on by forces conſpiring (in part at leaſt) with its motion, and *vice verſa*. Therefore, becauſe we ſee that it is always refracted towards the perpendicular, when paſſing from a void into any tranſparent ſubſtance, we muſt conclude that it is, on the whole, attracted by that ſubſtance. We muſt draw the ſame concluſion from obſerving, that it is refracted from the perpendicular in its paſſage out of any tranſparent ſubſtance whatever into a void. It has been attracted backwards by that ſubſtance.

This acceleration of light in refraction is contrary to the opinion of thoſe philoſophers who maintain, that illumination is produced by the undulation of an elaſtic medium. Euler attempts to prove, by mechanical laws, that the velocities of the incident and refracted light are proportional to the ſines of incidence and refraction, while our principles make them in this

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Cauſe of
Refraction.

ratio inverſely. Boſcovich propoſed a fine experiment for deciding this queſtion. The aberration of the fixed ſtars ariſes from the combination of the motion of light with the motion of the teleſcope by which it is obſerved. Therefore this aberration ſhould be greater or leſs when obſerved by means of a teleſcope filled with water, according as light moves ſlower or ſwifter through water than through air. He was miſtaken in the manner in which the concluſion ſhould be drawn from the obſervation made in the form preſcribed by him: and the experiment has not yet been made in a convincing manner; becauſe no fluid has been found of ſufficient tranſparency to admit of the neceſſary magnifying power. It is an experiment of the greateſt importance to optical ſcience.

2. If the light be moving within the tranſparent ſubſtance, and if its velocity (eſtimated in a direction perpendicular to the ſurface) do not exceed the ſpecific velocity of that ſubſtance, it will not emerge from it, but will be reflected backwards in an angle equal to that of its incidence. For it muſt be obſerved, that in the figure of laſt propoſition, the exceſs of the ſquare of EF above the ſquare of EL, is the ſame with the exceſs of the ſquare of KF above the ſquare of KL. Therefore the ſquare of the ſpecific velocity is equal to the augmentation or diminution of the ſquare of the perpendicular velocity. If therefore the initial perpendicular velocity FK (fig. 8.) be preciſely equal to the ſpecific velocity, the light will juſt reach the farther ſide of the attracting ſtratum, as at B, where its perpendicular velocity will be completely extinguiſhed, and its motion will be in the direction BT. But it is here under the influence of forces tending towards the plane KR, and its motion will therefore be ſtill incurvated towards it; and it will deſcribe a curve BD equal and ſimilar to EB, and finally emerge back from the refracting ſtratum into the tranſparent ſubſtance in an angle RDA equal to KEF.

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If the direction of the light be ſtill more oblique, ſo that its perpendicular velocity is leſs than the ſpecific velocity, it will not reach the plane ST, but be reflected as ſoon as it has penetrated ſo far that the ſpecific velocity of the part penetrated (eſtimated by the compounding part of the area of forces) is equal to its perpendicular velocity. Thus the ray *f* E will deſcribe the path E*d*D*a* penetrating to *bd*, ſo that the correſponding area of forces *abce* is equal to the ſquare of *fk*, its perpendicular velocity.

The extreme brilliancy of dew drops and of jewels had often excited the attention of philoſophers, and it always appeared a difficulty how light was reflected at all from the poſterior ſurface of tranſparent bodies. It afforded Sir Iſaac Newton his ſtrongeſt argument againſt the uſual theory of reflection, viz. that it was produced by impact on ſolid elaſtic matter. He was the firſt who took notice of the total reflection in great obliquities; and very properly aſked how it can be ſaid that there is any impact in this caſe, or that the reflecting impact ſhould ceaſe at a particular obliquity?

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Rays at a certain obliquity are wholly reflected by tranſparent ſubſtances.

It muſt be acknowledged that it is a very curious circumſtance, that a body which is perfectly tranſparent ſhould ceaſe to be ſo at a certain obliquity; that a great obliquity ſhould not hinder light from paſſing from a void into a piece of glaſs; but that the ſame obliquity ſhould prevent it from paſſing from the glaſs into a void. The fineſt experiment for illuſtrating the fact is, to take two pieces of mirror-glaſs, not ſilvered, and put them together with a piece of paper between them, forming a narrow margin all round to keep them apart. Plunge this apparatus into water. When it is held nearly parallel to the ſurface of the water, every thing at the bottom of the veſſel will be ſeen clearly through the glaſſes; but when they are turned ſo as to be inclined about 50 degrees, they will intercept the light as much as if they were plates of iron. It will be proper to ſoak the paper in varniſh, to prevent water from getting between the glaſſes.

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The brilliant cut in diamonds produces total reflection.

What is called the brilliant cut in diamonds, is ſuch a diſpoſition of the poſterior facets of the diamond, that the light is made to fall upon them ſo obliquely that none of it can go through, but all is reflected. To produce this effect in the greateſt poſſible degree is a matter of calculation, and merits the attention of the lapidary. When diamonds are too thin to admit of this form, they are cut in what is called the roſe faſhion. This has a plain back, and the facets are all on the front, and ſo diſpoſed as to refract the rays into ſufficient obliquities, to be ſtrongly reflected from the poſterior plane. Doublets are made by cutting one thin diamond roſe faſhion, and another ſimilar one is put behind it, with their plane ſurfaces joined. Or, more frequently, the outſide diamond has the anterior facets of the brilliant, and the inner has the form of the inner part of a brilliant. If they be joined with very pure and ſtrongly refracting varniſh, little light is reflected from the ſeparating plane, and their brilliancy is very conſiderable, though ſtill inferior to a true and deep brilliant. If no varniſh be uſed, much of the light is reflected from the flat ſide, and the effect of the poſterior facets is much diminiſhed. But doublets might be conſtructed, by making the touching ſurfaces of a ſpherical form (of which the curvature ſhould have a due proportion to the ſize of the ſtone), that would produce an effect nearly equal to that of the moſt perfect brilliant.

130
Refraction diminiſhes as the incident velocity increaſes.

3. Since the change made on the ſquare of the velocity of the incident light is a conſtant quantity, it follows, that the refraction will diminiſh as the velocity of the incident light increaſes. For if L *i* in fig. 7. be a conſtant quantity, and EL be increaſed, it is evident that the ratio of E*i*, or its equal EF, to EL will be diminiſhed, and the angle LEF, which conſtitutes the refraction, will be diminiſhed. The phyſical cauſe of this is eaſily ſeen: When the velocity of the incident light is increaſed, it employs leſs time in paſſing through the refracting ſtratum or ſpace between the planes ST and KR, and is therefore leſs influenced by the refracting forces. A ſimilar effect would follow if the tranſparent body were moving with great velocity towards the luminous body.

Some naturaliſts have accounted for the different refrangibility of the differently coloured rays, by ſuppoſing that the red rays move with the greateſt rapidity, and they have determined the difference of original velocity which would produce the obſerved difference of refraction. But this difference would be obſerved in the eclipſes of Jupiter's ſatellites. They ſhould be ruddy at their emerſions, and be ſome ſeconds before they attain their pure whiteneſs; and

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they ſhould become bluiſh immediately before they vaniſh in immerſions. This is not obſerved. Beſides, the difference in refrangibility is much greater in flint glaſs than in crown glaſs, and this would require a proportionally greater difference in the original velocities. The explanation therefore muſt be given up.

131 The refraction of a ſtar greater in the evening than in the morning.

It ſhould follow, that the refraction of a ſtar which is in our meridian at ſix o'clock in the evening ſhould be greater than that of a ſtar which comes on the meridian at ſix in the morning; becauſe we are moving away from the firſt, and approaching to the laſt. But the difference is but $\frac{1}{10000}$ of the whole, and cannot be obſerved with ſufficient accuracy in any way yet practiſed. A form of obſervation has been propoſed by Dr Blair profeſſor of practical aſtronomy in the univerſity of Edinburgh, which promiſes a very ſenſible difference of refraction. It is alſo to be expected, that a difference will be obſerved in the refraction of the light from the eaſt and weſtern ends of Saturn's ring. Its diameter is about 26 times that of the earth, and it revolves in 10h. 32′; ſo that the velocity of its edge is about $\frac{1}{10000}$ of the velocity of the ſun's light. If therefore the light be reflected from it according to the laws of perfect elaſticity, or in the manner here explained, that which comes to us from the weſtern extremity will move more ſlowly than that which comes from the eaſtern extremity in the proportion of 2500 to 2501. And if Saturn can be ſeen diſtinctly after a refraction of 30° through a priſm, the diameter of the ring will be increaſed one half in one poſition of the teleſcope, and will be as much diminiſhed by turning the teleſcope half round its axis; and an intermediate poſition will exhibit the ring of a diſtorted ſhape. This experiment is one of the moſt intereſting to optical ſcience, as its reſult will be a ſevere touchſtone of the theories which have been attempted for explaining the phenomena on mechanical principles.

If the tail of a comet be impelled by the rays of the ſun, as is with great probability ſuppoſed by Euler and others, the light by which its extreme parts are ſeen by us muſt have its velocity greatly diminiſhed, being reflected by particles which are moving away from the ſun with immenſe rapidity. This may perhaps be diſcovered by its greater aberration and refrangibility.

132 All light ſubject to the ſame

As common day light is nothing but the ſun's light reflected from terreſtrial bodies, it is reaſonable to expect that it will ſuffer the ſame refraction. But nothing but obſervation could aſſure us that this would be the caſe with the light of the ſtars; and it is rather ſurpriſing that the velocity of their light is the ſame with that of the ſun's light. It is a circumſtance of connexion between the ſolar ſyſtem and the reſt of the univerſe. It was as little to be looked for on the light of terreſtrial luminaries. If light be conceived as ſmall particles of matter emitted from bodies by the action of accelerating forces of any kind, the vaſt diverſity which we obſerve in the conſtitution of ſublunary bodies ſhould make us expect differences in this particular. Yet it is found, that the light of a candle, of a glow-worm, &c. ſuffers the ſame refraction, and conſiſts of the ſame colours. This circumſtance is adduced as an argument againſt the theory of emiſſion. It is thought more probable that this ſameneſs of velocity is owing to the nature of the medium, which determines the frequency of its undulations and the velocity of their propagation.

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Law refracti. when ht paſſes of one tiſ- parent b dy into other cor. tiguous to it.

4. When two tranſparent bodies are contiguous, the light in its paſſage out of the one into the other will be refracted towards or from the perpendicular, according as the refracting forces of the ſecond are greater or leſs than thoſe of the firſt, or rather according as the area expreſſing the ſquare of the ſpecific velocity is greater or leſs. And as the difference of theſe areas is a determined quantity, the difference between the velocity in the medium of incidence and the velocity in the medium of refraction, will alſo be a determined quantity. Therefore the ſine of the angle of incidence will be in a conſtant ratio to the ſine of the angle of refraction; and this ratio will be compounded of the ratio of the ſine of incidence in the firſt medium to the ſine of refraction in a void; and the ratio of the ſine of incidence in a void to the ſine of refraction in the ſecond medium. If therefore a ray of light, moving through a void in any direction, ſhall paſs through any number of media bounded by parallel planes, its direction in the laſt medium will be the ſame as if it had come into it from a void.

5. It alſo follows from theſe propoſitions, that if the obliquity of incidence on the poſterior ſurface of a tranſparent body be ſuch, that the light ſhould be reflected back again, the placing a maſs of the ſame or of another medium in contact with this ſurface, will cauſe it to be tranſmitted, and this the more completely, as the added medium is more denſe or more refractive; and the reflection from the ſeparating ſurface will be the more vivid in proportion as the poſterior ſubſtance is leſs denſe or of a ſmaller refractive power. It is not even neceſſary that the other body be in contact; it is enough if it be ſo near that thoſe parts of the refracting ſtrata which are beyond the bodies interfere with or coincide with each other.

All theſe conſequences are agreeable to experience. The brilliant reflection from a dew drop ceaſes when it touches the leaf on which it reſts: The brilliancy of a diamond is greatly damaged by moiſture getting behind it: The opacity of the combined mirror plates, mentioned in the ſecond corollary, is removed by letting water get between them: A piece of glaſs is diſtinctly or clearly ſeen in air, more faintly when immerſed in water, ſtill more faintly amidſt oil of olives, and it is hardly perceived in ſpirits of turpentine. Theſe phenomena are incompatible with the notion that reflection is occaſioned by impact on ſolid matter, whether of the tranſparent body, or of any ether or other fancied fluid behind it; and their perfect coincidence with the legitimate conſequences of the aſſumed principles, is a ſtrong argument in favour of the truth of thoſe principles.

134 An objection to the Newtonian theory of refraction.

It is worth while to mention here a fact taken notice of by Mr Beguelin, and propoſed as a great difficulty in the Newtonian theory of refraction. In order to get the greateſt poſſible refraction, and the ſimpleſt meaſure of the refracting power at the anterior ſurface of any tranſparent ſubſtance, Sir Iſaac Newton enjoins us to employ a ray of light falling on the ſurface *quam obliquiſſimè*. But Mr Beguelin found, that when the obliquity of incidence in glaſs was about

89°

89° 50′, no light was refracted, but that it was wholly reflected. He alſo obſerved, that when he gradually increaſed the obliquity of incidence on the poſterior ſurface of the glaſs, the light which emerged laſt of all did not ſkim along the ſurface, making an angle of 90° with the perpendicular, as it ſhould do by the Newtonian theory, but made an angle of more than ten minutes with the poſterior ſurface. Alſo, when he began with very great obliquities, ſo that all the light was reflected back into the glaſs, and gradually diminiſhed the obliquity of incidence, the firſt ray of light which emerged did not ſkim along the ſurface, but was raiſed about 10 or 15 minutes.

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Shown to be the neceſſary conſequence of that theory, and of courſe a confirmation of it.

But all theſe phenomena are neceſſary conſequences of our principles, combined with what obſervation teaches us concerning the forces which bodies exert on the rays of light. It is evident, from the experiments of Grimaldi and Newton, that light is both attracted and repelled by ſolid bodies. Newton's ſagacious analyſis of theſe experiments diſcovered ſeveral alternations of actual inflection and deflection; and he gives us the preciſe diſtance from the body when ſome of theſe attractions end and repulſion commences; and the moſt remote action to be obſerved in his experiments is repulſion. Let us ſuppoſe this to be the caſe, although it be not abſolutely neceſſary. Let us ſuppoſe that the forces are repreſented by the ordinates of a curve *a b n p c* (fig. 7.) which croſſes the abſciſſa in *b*. Draw *b o* parallel to the refracting ſurface. When the obliquity of incidence of the ray A B has become ſo great, that its path in the glaſs, or in the refracting ſtratum, does not cut, but only touches the line *o b*, it can penetrate no further, but is totally reflected; and this muſt happen in all greater obliquities. On the other hand, when the ray LE, moving within the glaſs, has but a very ſmall perpendicular velocity, it will penetrate the refracting ſtratum no further than till this perpendicular velocity is extinguiſhed, and its path becomes parallel to the ſurface, and it will be reflected back. As the perpendicular velocity increaſes by diminiſhing the obliquity of incidence, it will penetrate farther; and the laſt reflection will happen when it penetrates ſo far that its path touches the line *o b*. Now diminiſh the obliquity by a ſingle ſecond; the light will get over the line *o b*, will deſcribe an arch *o d* B concave upwards, and will emerge in a direction BA, which does not ſkim the ſurface, but is ſenſibly raiſed above it. And thus the facts obſerved by M. Beguelin, inſtead of being an objection againſt this theory, afford an argument in its favour.

Plate CCCLIV.

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Euler's theory of undulation contrary to fact;

7. Thoſe philoſophers who maintain the theory of undulation, are under the neceſſity of connecting the diſperſive powers of bodies with their mean refractive powers. M. Euler has attempted to deduce a neceſſary difference in the velocity of the rays of different colours from the different frequency of the undulations, which he aſſigns as the cauſe of their different colorific powers. His reaſoning on this ſubject is of the moſt delicate nature, and unintelligible to ſuch as are not completely maſter of the infiniteſimal calculus of partial differences, and is unſatisfactory to ſuch as are able to go through its intricacies. It is contradicted by fact. He ſays, and indeed to be conſiſtent he muſt ſay it, that muſical ſounds which differ greatly in acuteneſs are propagated through the air with different velocities: but one of the ſmalleſt bells in the chimes of St Giles's church in Edinburgh was ſtruck againſt the rim of the very deep-toned bell on which the hours are ſtruck. When the ſound was liſtened to by a nice obſerver at the diſtance of more than two miles, no interval whatever could be obſerved. A ſimilar experiment was exhibited to M. Euler himſelf, by means of a curious muſical inſtrument (if it can be ſo called) uſed at St Peterſburgh, and which may be heard at three or four miles diſtance. But the experiment with the bells is unexceptionable, as the two ſounds were produced in the very ſame inſtant. This connexion between the refrangibility in general and the velocity muſt be admitted, in its full extent, in every attempt to explain refraction by undulation; and Euler was forced by it to adopt a certain conſequence which made a neceſſary connection between the mean refraction and the diſperſion of heterogeneous rays. Confident of his analyſis, he gave a deaf ear to all that was told him of Mr Dollond's improvements on teleſcopes, and aſſerted, that they could not be ſuch as were related; for an increaſe of mean refraction muſt always be accompanied with a *determined* increaſe of diſperſion. Newton had ſaid the ſame thing, being miſled by a limited view of his own principles; but the diſperſion aſſigned by him was different from that aſſigned by Euler. The diſpute between Euler and Dollond was confined to the deciſion of this queſtion only; and when ſome glaſſes made by a German chemiſt at St Peterſburgh convinced Euler that his determination was erroneous, he had not the candour to give up the principle which had forced him to this determination of the diſperſion, but immediately introduced a new theory of the achromatic teleſcopes of Dollond; a theory which took the artiſts out of the track marked out by mathematicians, and in which they had made conſiderable advances, and led them into another path, propoſing *maxims* of conſtruction hitherto untried, and inconſiſtent with real improvements which they had already made. The leading principle in this theory is to arrange the different ultimate images of a point which ariſe either from the errors of a ſpherical figure or different refrangibility, in a ſtraight line paſſing through the centre of the eye. The theory itſelf is ſpecious; and it requires great mathematical ſkill to accompliſh this point, and hardly leſs to decide on the propriety of the conſtruction which it recommends. It is therefore but little known. But that it is a falſe theory, is evident from one ſimple conſideration. In the moſt indiſtinct viſion ariſing from the worſt conſtruction, this rectilineal arrangement of the images obtains completely in that pencil which is ſituated in the axis, and yet the viſion is indiſtinct. But, what is to our preſent purpoſe, this new theory is purely mathematical, ſuiting any obſerved diſperſive power, and has no connexion with the phyſical theory of undulations, or indeed with any mechanical principles whatever. But, by admitting any diſperſive power, whatever may be the mean refraction, all the phyſical doctrines in his *Nova Theoria Lucis et Colorum* are overlooked, and therefore never once mentioned, although the effects of Mr Zeiher's glaſs are taken notice of as inconſiſtent with that mechanical propoſition.

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and miſleads artiſts.

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propoſition of Newton's which occaſioned the whole diſpute between Euler and Dollond.

They are indeed inconſiſtent with the univerſality of that propoſition. Newton advances it in his Optics merely as a mathematical propoſition highly probable, but ſays that it will be corrected *if he ſhall find it* falſe. The ground on which he *ſeems* (for he does not expreſsly ſay ſo) to reſt its probability is a limited view of his own principle, the action of bodies on light. He (not knowing any cauſe to the contrary) ſuppoſed that the action of all bodies was ſimilar on the different kinds of light, that is, that the ſpecific velocities of the differently coloured rays had a determined proportion to each other. This was gratuitous; and it might have been doubted by him who had obſerved the analogy between the chemical actions of bodies by elective attractions and repulſions, and the ſimilar actions on light. Not only have different menſtrua unequal actions on their ſolids, but the order of their affinities is alſo different. In like manner, we might expect not only that ſome bodies would attract light in general more than others, but alſo might differ in the proportion of their actions on the different kinds of light, and this ſo much, that ſome might even attract the red more than the violet. The late diſcoveries in chemiſtry ſhow us ſome very diſtinct proofs, that light is not exempted from the laws of chemical action, and that it is ſuſceptible of chemical combination. The changes produced by the ſun's light on vegetable colours, ſhows the neceſſity of illumination to produce the green fecula; and the aromatic oils of plants, the irritability of their leaves by the action of light, the curious effects of it on the mineral acids, on mangeneſe, and the calces of biſmuth and lead, and the imbibition and ſubſequent emiſſion of it by phoſphoreſcent bodies, are ſtrong proofs of its chemical affinities, and are quite inexplicable on the theory of undulations.

All theſe conſiderations taken together, had they been known to Sir Iſaac Newton, would have made him expect differences quite anomalous in the diſperſive powers of different tranſparent bodies; at the ſame time that they would have afforded to his ſagacious mind the ſtrongeſt arguments for the actual emiſſion of light from the luminous body.

Having in this manner eſtabliſhed the obſerved law of refraction on mechanical principles, ſhowing it to be a neceſſary conſequence of the known action of bodies on light, we proceed to trace its mathematical conſequences through the various caſes in which it may be exhibited to our obſervation. Theſe conſtitute that part of the mathematical branch of optical ſcience which is called *dioptrics*.

138 The variation of the intenſity of attractions and repulſions unknown.

We are quite unacquainted with the law of action of bodies on light, that is, with the variation of the intenſity of the attractions and repulſions exerted at different diſtances. All that we can ſay is, that from the experiments and obſervations of Grimaldi, Newton, and others, light is deflected towards a body or is attracted by it, at ſome diſtances, and repelled at others, and this with a variable intenſity. The action may be extremely different, both in extent and force, in different bodies, and change by a very different law with the ſame change of diſtance. But, amidſt all this variety, there is a certain ſimilarity ariſing from the joint action of many particles, which ſhould be noticed, becauſe it tends both to explain the ſimilarity obſerved in the refractions of light, and alſo its connexion with the phenomena of reflection.

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The law of variation in the action of many particles different from that of one; bu may be known if it be known. Plate CCCLIV.

The law of variation in the joint action of many particles adjoining to the ſurface of a refracting medium, is extremely different from that of a ſingle particle; but when this laſt is known, the other may be found out. We ſhall illuſtrate this matter by a very ſimple caſe. Let DE (fig. 9.) be the ſurface of a medium, and let us ſuppoſe that the action of a particle of the medium on a particle of light extends to the diſtance EA, and that it is proportional to the ordinates ED, F*f*, G*g*, H*h*, &c. of the line A*h*C*gf*D; that is, that the action of the particle E of the medium on a particle of light in F, is to its action on a particle in H as F*f* to H*h*, and that it is attracted at F but repelled at H, as expreſſed by the ſituation of the ordinates with reſpect to the abſciſſa. In the line AE produced to B, make EB, Eχ, Eκ, Eγ, Eφ, &c. reſpectively equal to EA, EH, EC, EG, EF, &c.

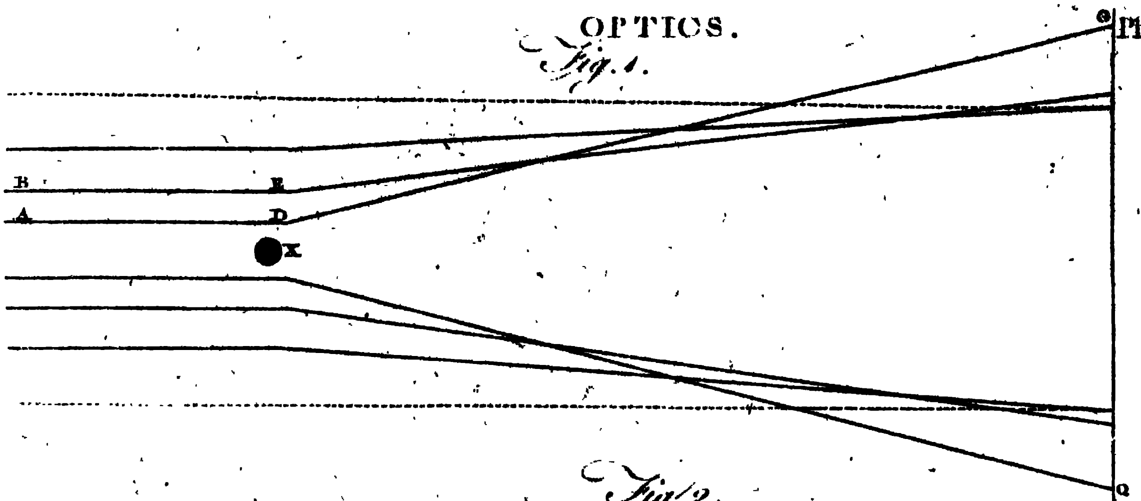
It is evident that a particle of the medium at B will exert no action on the particle of light in E, and that the particles of the medium in κ γ φ E, will exert on it actions proportional to H*h*, G*g*, F*f*, ED. Therefore, ſuppoſing the matter of the medium continuous, the whole action exerted by the row of particles EB will be repreſented by the area A*h*CDE; and the action of the particles between B and φ will be repreſented by the area A*h*C*f*F, and that of the particles between E and φ by the area F*f*DE.

Now let the particle of light be in F, and take F*o*=AE. It is no leſs evident that the particle of light in F will be acted on by the particles in E*o* alone, and that it will be acted on in the ſame manner as a particle in E is acted on by the particles in φB. Therefore the action of the whole row of particles EB on a particle in F will be repreſented by the area A*h*C*f*F. And thus the action on a particle of light in any point of AE will be repreſented by the area which lies beyond it.

But let us ſuppoſe the particles of light to be within the medium, as at φ, and make φ*d*=AE. It is again evident that it is acted on by the particles of the medium between φ and *d* with a force repreſented by the area A*h*CDE, and in the oppoſite direction by the particles in Eφ with a force repreſented by the area F*f* DE. This balances an equal quantity of action, and there remains an action expreſſed by the area A*h*C*f*F. Therefore, if an equal and ſimilar line to A*h*CDE be deſcribed on the abſciſſa EB, the action of the medium on a particle of light in φ will be repreſented by the area φ*fκh*B, lying beyond it.

If we now draw a line AKLMRNPB, whoſe ordinates CK, FQ, φR, &c. are as the areas of the other curve, eſtimated from A and B; theſe ordinates will repreſent the whole forces which are exerted by the particles in EB, on a particle of light moving from A to B. This curve will cut the axis in points L, N ſuch, that the ordinates drawn through them intercept areas of the firſt curve, which are equal on each ſide of the axis; and in theſe points the particle of light ſuſtains no action from the medium. Theſe points are very

Fig. 1.



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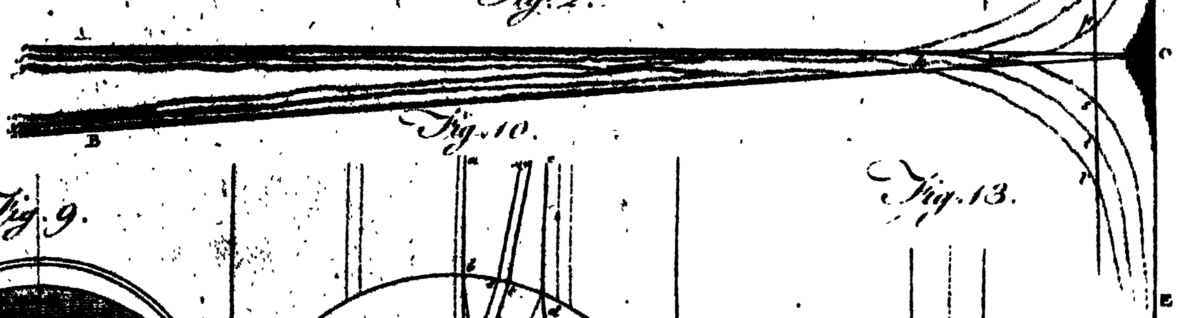

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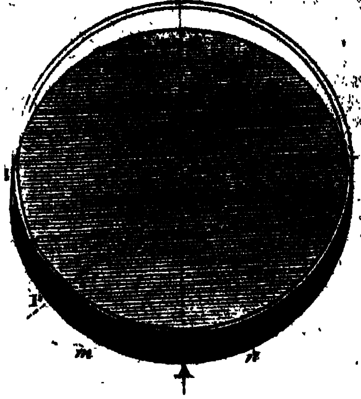

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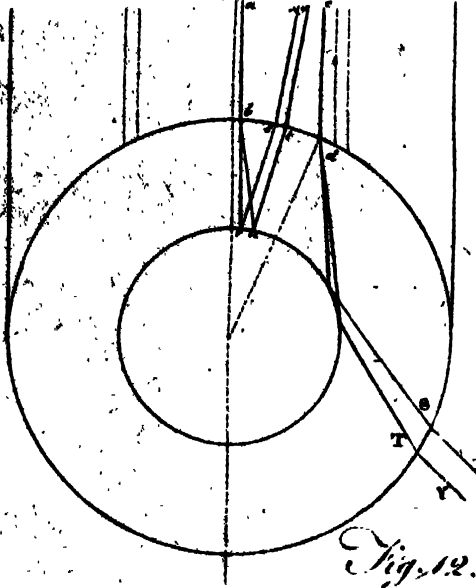

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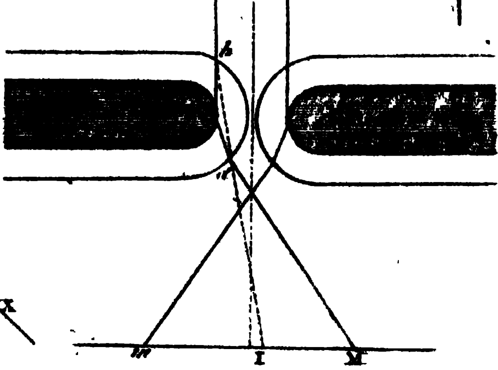

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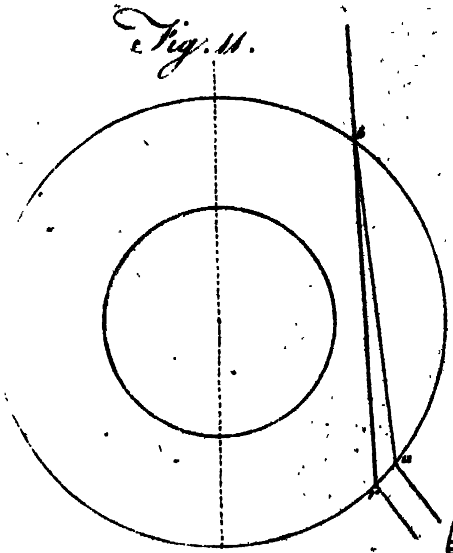

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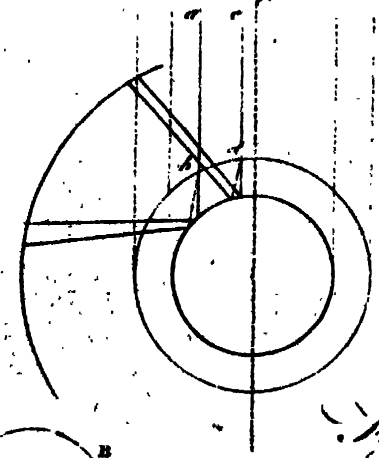

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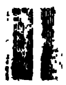

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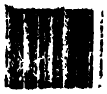

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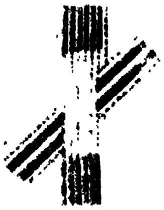

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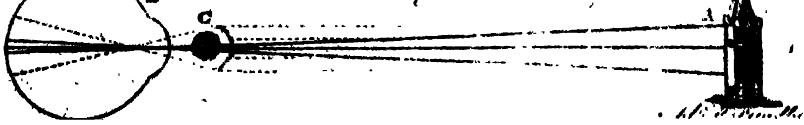

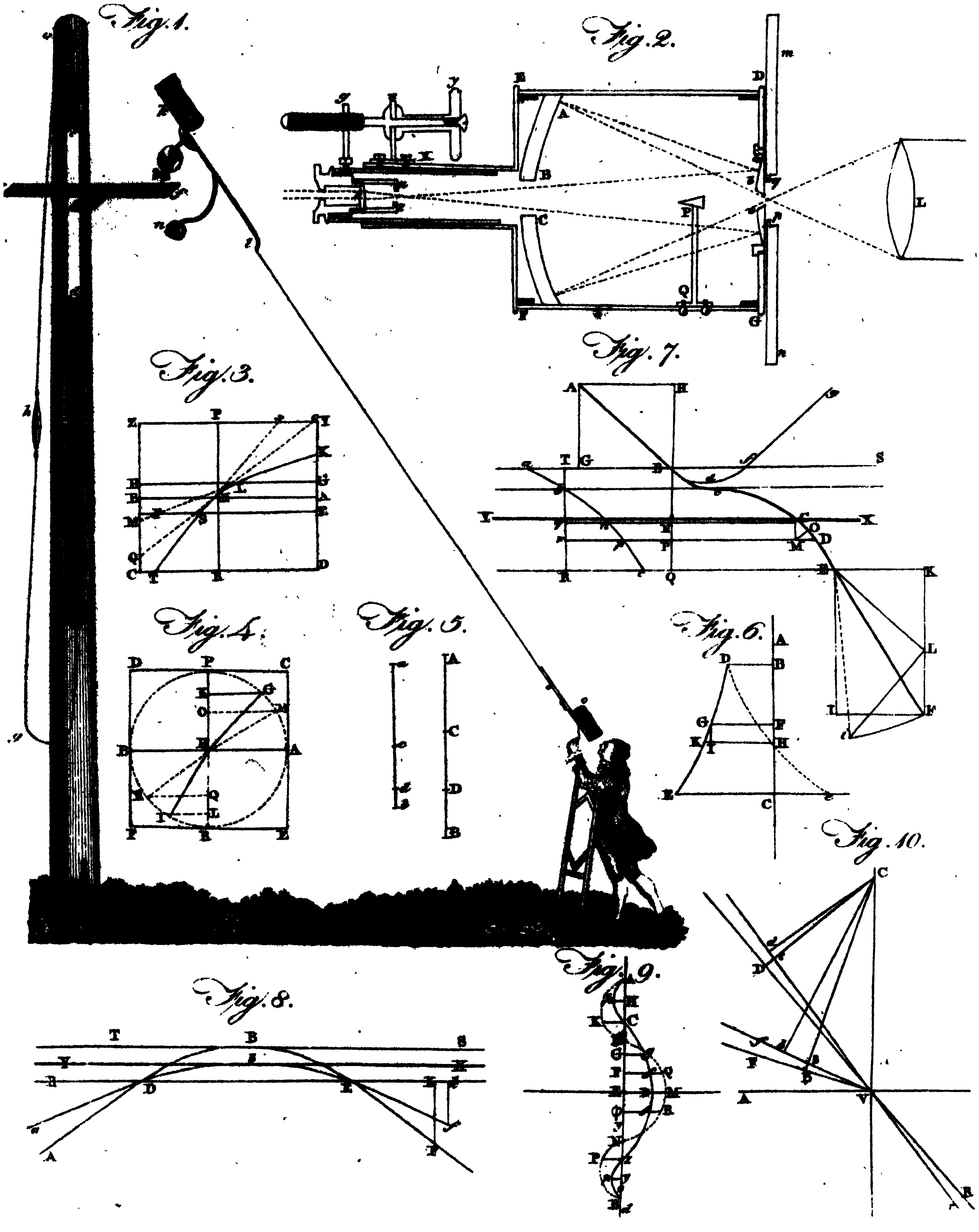
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Cauſe of Refraction.

very different from the ſimilar points of the curve expreſſing the action of a ſingle particle. Theſe laſt are in the very places where the light ſuſtains the greateſt repulſive action of the whole row of particles. In the ſame manner may a curve be conſtructed, whoſe ordinates expreſs the united action of the whole medium.

From theſe obſervations we learn in general, that a particle of light within the ſpace of action is acted on with equal forces, and in the ſame direction, when at equal diſtances on each ſide of the ſurface of the medium.

Of the focal diſtance of rays refracted by paſſing out of one medium into another of different denſity and through a plane ſurface.

Lemma. The indefinitely ſmall variation of the angle of incidence is to the ſimultaneous variation of the angle of refraction as the tangent of incidence is to the tangent of refraction; or, the cotemporaneous variations of the angles of incidence and refraction are proportional to the tangents of theſe angles.

Plate CCCLIV. 140 Laws of refraction in plane ſurfaces.

Let RVF, rVf (fig. 10.) be the progreſs of the rays refracted at V (the angle rVR being conſidered in its naſcent or evaneſcent ſtate), and VC perpendicular to the refracting ſurface VA. From C draw CD, CB, perpendicular to the incident and refracted rays RV, VF, cutting rV, Vf in δ and β, and let Cd, Cb be perpendicular to rV, Vf.

Becauſe the ſines of incidence and refraction are in a conſtant ratio, their ſimultaneous variations are in the ſame conſtant ratio. Now the angle RVr is to the angle FVf in the ratio of $\frac{B\beta}{BV}$ to $\frac{D\delta}{DV}$; that is, of $\frac{BC}{BV}$ to $\frac{DC}{DV}$: that is, of $\frac{\text{ſin. incid.}}{\text{coſ. incid.}}$ to $\frac{\text{ſin. refr.}}{\text{coſ. refr.}}$; that is, of *tan. incid.* to *tan. refr.*

Corollary. The difference of theſe variations is to the greateſt or leaſt of them as the difference of the tangents to the greateſt or leaſt tangent.

PROBLEM.

Plate CCCLV.

Let two rays RV, RP diverge from, or converge to, a point R (figs. 1, 2, 3, 4.), and paſs through the plane ſurface PV ſeparating two refracting mediums AB, of which let B be the moſt refracting, and let RV be perpendicular to the ſurface. It is required to determine the point of diſperſion or convergence, F, of the refracted rays VD, PE.

Make VR to VG as the ſine of refraction to the ſine of incidence, and draw GIK parallel to the ſurface, cutting the incident ray in I. About the centre P, with the radius PI, deſcribe an arch of a circle IF, cutting VR in F; draw PE tending from or towards F. We ſay PE is the refracted ray, and F the point of diſperſion or convergence of the rays RV, RP, or the conjugate focus to R.

For ſince GI and PV are parallel and PF equal to PI, we have PF : PR=PI : PR,=VG : VR,=ſin. incid. : ſin. refr. But PF : PR=ſin. PRV : ſin. PFV, and RRV is equal to the angle of incidence at P; therefore PFV is the correſponding angle of refraction, FPE is the refracted ray, and F the conjugate focus to R.

Cauſe of Refraction.

Corol. 1. If diverging or converging rays fall on the ſurface of a more refracting medium, they will diverge or converge leſs after refraction, F being farther from the ſurface than R. The contrary muſt happen when the diverging or converging rays fall on the ſurface of a leſs refracting medium, becauſe, in this caſe, F is nearer to the ſurface than R.

Corol. 2. Let Rp be another ray, more oblique than RP, the refracting point p being farther from V, and let fpe be the refracted ray, determined by the ſame conſtruction. Becauſe the arches FI, fi, are perpendicular to their radii, it is evident that they will converge to ſome point within the angle RIK, and therefore will not croſs each other between F and I: therefore Rf will be greater than RF, as RF is greater than RG, for ſimilar reaſons. Hence it follows, that all the rays which tended from or towards R, and were incident on the whole of VPp, will not diverge from or converge to F, but will be diffuſed over the line GFf. This diffuſion is called aberration from the focus, and is ſo much greater as the rays are more oblique. No rays flowing from or towards R will have point of concourſe with RV nearer to R than F is: But if the obliquity be inconſiderable, ſo that the ratio of RP to FP does not differ ſenſibly from that of RV to FV, the point of concourſe will not be ſenſibly removed from G. G is therefore uſually called the *conjugate focus* to R. It is the conjugate focus of an indefinitely ſlender pencil of rays falling perpendicularly on the ſurface. The conjugate focus of an oblique pencil, or even of two oblique rays, whoſe diſperſion on the ſurface is conſiderable, is of more difficult inveſtigation. See *Graveſande's Natural Philoſophy* for a very neat and elementary determination (E).

In a work of this kind, it is enough to have pointed out, in an eaſy and familiar manner, the nature of optical aberration. But as this is the chief cauſe of the imperfection of optical inſtruments, and as the only method of removing this imperfection is to diminiſh this aberration, or correct it by a ſubſequent aberration in the oppoſite direction, we ſhall here give a fundamental and very ſimple propoſition, which will (with obvious alterations) apply to all important caſes. This is the determination of the focus of an infinitely ſlender pencil of oblique rays RP, Rp.

"Retaining the former conſtructions for the ray PF, (fig. 1.) ſuppoſe the other ray Rp infinitely near to RP. Draw PS perpendicular to PV, and Rr perpendicular to RP, and make Pr : PS=VR : VF. On Pr deſcribe the ſemicircle rRP, and on PS the ſemicircle $S\varphi P$, cutting the refracted ray PF in φ, draw pr, pS, $p\varphi$." It follows

---

(E) We refer to Graveſande, becauſe we conſider it as of importance to make ſuch a work as ours ſerve as a general index to ſcience and literature. At the ſame time we take the liberty to obſerve, that the focus in queſtion is virtually determined by the conſtruction which we have given: for the points P, F of the line PF are determined, and therefore its poſition is alſo determined. The ſame is true of the poſition of pf, and therefore the interſection φ of the two lines is likewiſe determined.

Refraction by Spherical Surfaces.

follows from the lemma, that if φ be the focus of refracted rays, the variation $P\varphi p$ of the angle of refraction is to the correſponding variation PRp of the angle of incidence as the tangent of the angle of refraction VFP to the tangent of the angle of incidence VRP. Now Pp may be conſidered as coinciding with the arch of the ſemicircles. Therefore the angles PRp, Prp are equal, as alſo the angles $P\varphi p$, PSp. But PSp is to Prp as Pr to PS; that is, as VR to VF; that is, as the cotangent of the angle of incidence to the cotangent of the angle of refraction; that is, as the tangent of the angle of refraction to the tangent of the angle of incidence. Therefore the point φ is the focus.

Of Refraction by Spherical Surfaces.

General Problem.

To find the focus of refracted rays, the focus of incident rays being given.

Plate CCCLV.

Let $PV\pi$ (figs. 5, 6, 7, 8, 9, 10, 11, 12, 13, 14,) be a ſpherical ſurface whoſe centre is C, and let the incident light diverge from or converge to R.

Solution. Draw the ray RC through the centre, cutting the ſurface in the point V, which we ſhall denominate the *vertex*, while RC is called the *axis*. This ray paſſes on without refraction, becauſe it coincides with the perpendicular to the ſurface. Let RP be another incident ray, which is refracted at P, draw the radius PC. In RP make RE to RP as the ſine of incidence m to the ſine of refraction n; and about the centre R, with the diſtance RE, deſcribe the circle EK, cutting PC in K; draw RK and PF parallel to it, cutting the axis in F. PF is the refracted ray, and F is the focus.

141 The focus of rays refracted by ſpherical ſurfaces aſcertained.

For the triangles PCF, KCR are ſimilar, and the angles at P and K are equal. Alſo RK is equal to RE, and RPD is the angle of incidence. Now $m:n=RK:RP$, $=$ſin. DPR : ſin. RKP, $=$ſin. DPR : ſin. CPF. Therefore CPF is the angle of refraction correſponding to the angle of incidence RPD, and PF is the refracted ray, and F the focus. Q. E. D.

Cor. 1. $CK:CP=CR:CF$, and $CF=\frac{CP\times CR}{CK}$; Now $CP\times CR$ is a conſtant quantity; and therefore CF is reciprocally as CK, which evidently varies with a variation of the arch VP. Hence it follows, that all the rays flowing from R are not collected as the conjugate focus F. The ultimate ſituation of the point F, as the point P gradually approaches to, and at laſt coincides with, V, is called *the conjugate focus of central rays*, and the diſtance between this focus and the focus of a lateral ray is called *the aberration* of that ray, ariſing from the ſpherical figure.

There are, however, two ſituations of the point R ſuch, that all the rays which flow from it are made to diverge from one point. One of thoſe is C (fig. 5.), becauſe they all paſs through without refraction, and therefore ſtill diverge from C; the other is when rays in the rare medium with a convex ſurface flow from a point R, ſo ſituated beyond the centre that CV is to CR as the ſine of incidence in the rare medium is to the ſine of refraction in the denſer, or when rays in the rare medium fall on the convex ſurface of the denſer, converging to F, ſo ſituated that $CF:CV=m:n$. In this caſe they will all be diſperſed from F, ſo ſituated that $CV:CF=n:m$, $=CR:CV$ for ſine RPC : ſine RKC$=n:m$, $=CR:CP$, $=$ſine RPC : ſine PRC. Therefore the angle PRC is equal to RKC, or to FPC (by conſtruction of the problem), and the angle C is common to the triangles PRC, FPC; they are therefore ſimilar, and the angles PRC, FPC are equal, and $n:m=CP:CF$, $=CK:CR$, $=CR:CP$; therefore $CP:CK=CP^2:CR^2$: but CP and CR are conſtant quantities, and therefore CK is a conſtant quantity, and (by the corollary) CF is a conſtant quantity, and all the rays flowing from R are diſperſed from F by refraction. In like manner rays converging to F will by refraction converge to R. This was firſt obſerved by Huygens.

2. If the incident ray R′P (fig. 5.) is parallel to the axis RC, we have PO to CO as the ſine of incidence to the ſine of refraction. For the triangles R′PK′ PCO are ſimilar, and $PO:CO=R'K':R'P$, $=m:n$,

3. In this caſe, too, we have the focal diſtance of central parallel rays reckoned from the vertex $=\frac{m}{m-n}\times VC$. For ſince PO is ultimately VO, we have $m:n=VO:CO$, and $m-n:m=VO-CO:VO$, $=VC:VO$, and $VO=\frac{m}{m-n}\times VC$. This is called the principal focal diſtance, or focal diſtance of parallel rays. Alſo CO, the principal focal diſtance reckoned from the centre, $=\frac{n}{m-n}\times VC$.

N. B. When m is leſs that n, $m-n$ is a negative quantity.—Alſo obſerve, that in applying ſymbols to this computation of the focal diſtances, thoſe lines are to be accounted poſitive which lie from their beginnings, that is, from the vertex, or the centre, or the radiant point, in the direction of the incident rays. Thus when rays diverge from R on the convex ſurface of a medium, VR is accounted negative and VC poſitive. If the light paſſes out of air into glaſs, m is greater than n; but if it paſſes out of glaſs into air, m is leſs than n. If, therefore, parallel rays fall on the convex ſurface of glaſs out of air, in which caſe $m:n=3:2$ very nearly, we have for the principal focal diſtance $\frac{3}{3-2}VC$, or $+3VC$. But if it paſs out of glaſs into the convex ſurface of air, we have $VO=\frac{2}{2-3}VC$, or $-2VC$; that is, the focus O will be in the ſame ſide of the ſurface with the incident light. In like manner, we ſhall have for theſe two caſes $CO=+2VC$ and $-3VC$.

4. By conſtruction we have $RK:RP=m:n$

by ſimilarity of triangles $PF:RK=CF:CR$

therefore $PF:PR=mCF:nCR$

and $mPR\times CF=nCR\times PF$

therefore $mPR:nCR=PF:CF$

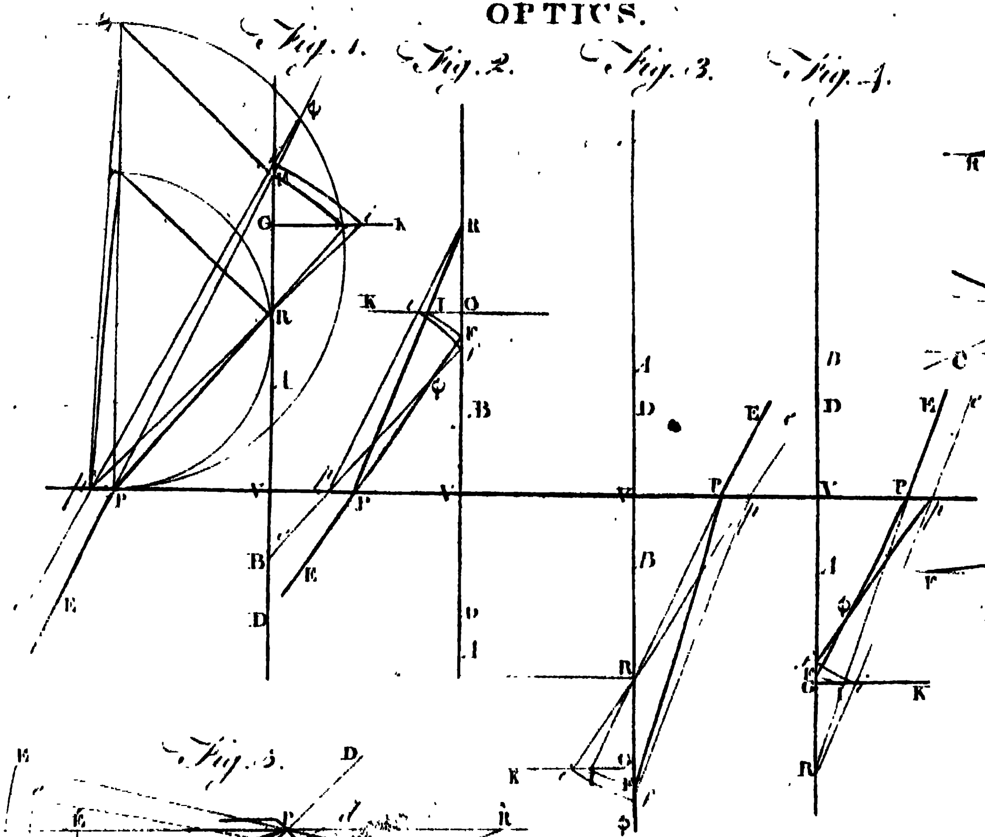
and $mPR-nCR:mPR=PF-CF:PF$

ultimately $mVR-nCR:mVR=VC:VF$

This is a very general optical theorem, and affords an eaſy method for computing the focal diſtance of refracted rays.

For this purpoſe let VR, the diſtance of the radiant point,

OPTICS. Plate CCCLV.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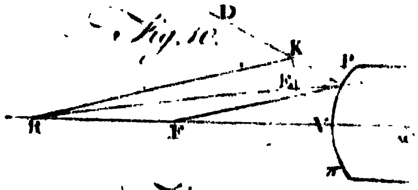
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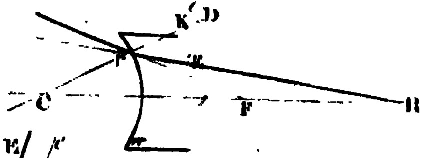
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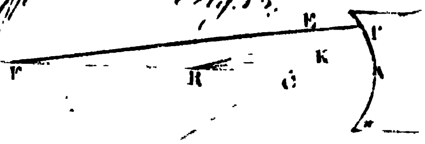
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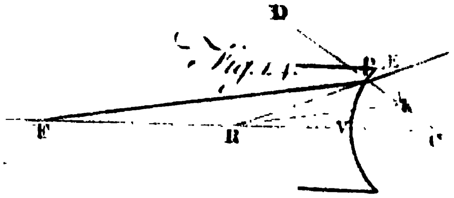
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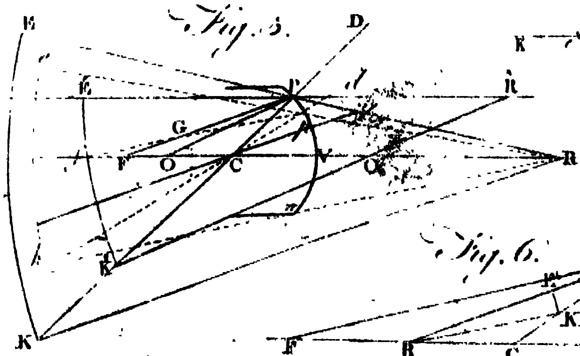
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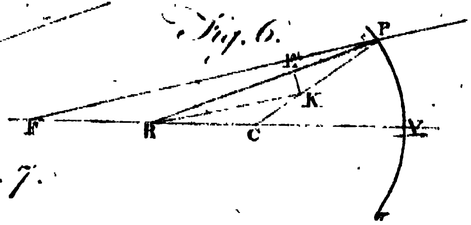
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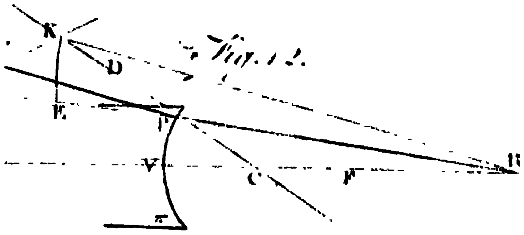
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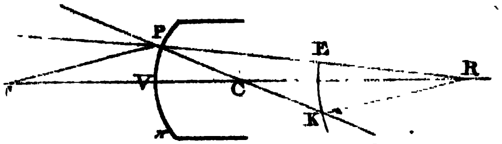
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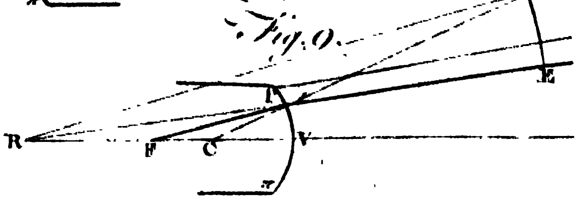
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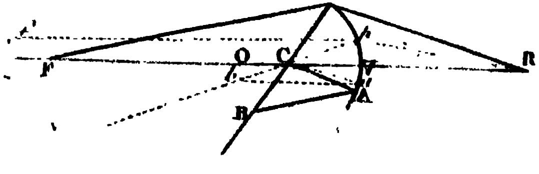
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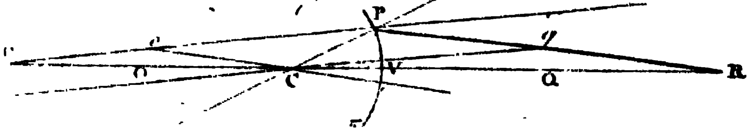
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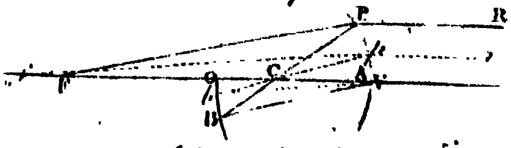


Fig. 16.

A. Bell Prin. Wal. Sculptor fecit.

Refraction by Spherical Surfaces.

point, be expreſſed by the ſymbol r, the diſtance of the focus of refracted rays by the ſymbol f, and the radius of the ſpherical ſurface by a; we have

$$mr - n\overline{r - a} : mr = a : f, \text{ and}$$

$$f = -$$

$$mr - n\,\overline{r - a} \qquad m - nr + nd$$

In its application due attention muſt be paid to the qualities of r and a, whether they be poſitive or negative, according to the conditions of laſt corollary.

Plate CCCLV.

5. If Q (fig. 8.) be the focus of parallel rays coming from the oppoſite ſide, we ſhall have RQ : QC=RV : VF. For draw Cq parallel to PF, cutting RP in q; then Rq : qC=RP : PF. Now q is the focus of the parallel rays FP, Cq. And when the point P ultimately coincides with the point V, q muſt coincide with Q, and we have RQ : QC=RV : VF.

This is the moſt general optical theorem, and is equally applicable to lenſes, or even to a combination of them, as to ſimple ſurfaces. It is alſo applicable to reflections, with this difference, that Q is to be aſſumed the focus of parallel rays coming the *ſame* way with the incident rays. It affords us the moſt compendious methods of computing ſymbolically and arithmetically the focal diſtances in all caſes.

6. We have alſo Rq : RP=RV : RF, and ultimately for central rays RQ : RV=RV : RF, and RF=$\frac{RV^2}{RQ}$. This propoſition is true in lenſes and mirrors, but not in ſingle refracting ſurfaces.

7. Alſo Rq : RC=RP : RF, and ultimately RQ : RV=RC : RF, and RF=$\frac{RV \times RC}{RQ}$. *N. B.* Theſe four points Q, V, C, F, either lie all one way from R, or two of them forward and two backward.

8. Alſo, making O the principal focus of rays coming the ſame way, we have Rq : qC=Co : oF, and ultimately RQ : Qc=cO : OF, and OF=$\frac{QC \times CO,}{RQ}$ and therefore reciprocally proportional to RQ, becauſe QC×co is a conſtant quantity.

Theſe corollaries or theorems give us a variety of methods for finding the focus of refracted rays, or the other points related to them; and each formula contains four points, of which any three being given the fourth may be found. Perhaps the laſt is the moſt ſimple, as the quantity $oc+c$Q is always negative, becauſe o and Q are on different ſides.

9. From this conſtruction we may alſo derive a very eaſy and expeditious method of drawing many refracted rays. Draw through the centre C (fig. 15. 16.) a line to the point of incidence P, and a line CA parallel to the incident ray RP. Take VO to VC as the ſine of incidence to the ſine of refraction, and about A, with the radius VO, deſcribe an arch of a circle cutting PC produced in B. Join AB: and PF parallel to AB is the refracted ray. When the incident light is parallel to RC, the point A coincides with V, and a circle deſcribed round V with the diſtance VO will cut the lines PC, pC, &c. in the points Bb. The demonſtration is evident.

Having thus determined the focal diſtance of refracted rays, it will be proper to point out a little more particularly its relation to its conjugate focus of incident rays. We ſhall conſider the four caſes of light incident on the convex or concave ſurface of a denſer or a rarer medium.

Refraction by Spherical Surfaces.

1. Let light moving in air fall on the convex ſurface of glaſs (fig. 5. to fig. 14.). Let us ſuppoſe it tending to a point beyond the glaſs infinitely diſtant. It will be collected to its principal focus o beyond the vertex V. Now let the incident light converge a little, ſo that R is at a great diſtance beyond the ſurface. The focus of refracted rays F will be a little within O or nearer to V. As the incident rays are made to converge more and more, the point R comes nearer to V, and the point F alſo approaches it, but with a much ſlower motion, being always ſituated between O and C till it is overtaken by R at the centre C, when the incident light is perpendicular to the ſurface in every point, and therefore ſuffers no refraction. As R has overtaken F at C, it now paſſes it, and is again overtaken by it at V. Now the point R is on the ſide from which the light comes, that is, the rays diverge from R. After refraction they will diverge from F a little without R; and as R recedes farther from V, F recedes ſtill farther, and with an accelerated motion, till, when R comes to Q, F has gone to an infinite diſtance, or the refracted rays are parallel. When R ſtill recedes, F now appears on the other ſide, or beyond V; and as R recedes back to an infinite diſtance, F has come to O: and this completes the ſeries of variations, the motion of F during the whole changes of ſituation being in the ſame direction with the motion of R.

2. Let the light moving in air fall on the concave ſurface of glaſs; and let us begin with parallel incident rays, conceiving, as before, R to lie beyond the glaſs at an infinite diſtance. The refracted rays will move as if they came from the principal focus O, lying on that ſide of the glaſs from which the light comes. As the incident rays are made gradually more converging, and the point of convergence R comes toward the glaſs, the conjugate focus F moves backward from O; the refracted rays growing leſs and leſs diverging, till the point R comes to Q, the principal focus on the other ſide. The refracted rays are now parallel, or F has retreated to an infinite diſtance. The incident light converging ſtill more, or R coming between Q and V, F will appear on the other ſide, or beyond the ſurface, or within the glaſs, and will approach it with a retarded motion, and finally overtake R at the ſurface of the glaſs. Let R continue its motion backwards (for it has all the while been moving backwards, or in a direction contrary to that of the light); that is, let R now be a radiant point, moving backwards from the ſurface of the glaſs. F will at firſt be without it, but will be overtaken by it at the centre C, when the rays will ſuffer no refraction. R ſtill receding will get without F; and while R recedes to an infinite diſtance, F will recede to O, and the ſeries will be completed.

3. Let the light moving in glaſs fall on the convex ſurface of air; that is, let it come out of the concave ſurface of glaſs, and let the incident rays be parallel, or tending to R, infinitely diſtant: they will be diſperſed by refraction from the principal focus O within the glaſs. As they are made more converging, R comes nearer, and F retreats backward, till R comes

to Q, the principal focus without the glaſs; when F is now at an infinite diſtance within the glaſs, and the refracted rays are parallel. R ſtill coming nearer, F now appears before the glaſs, overtakes R at the centre C, and is again overtaken by it at V. R now becoming a radiant point within the glaſs, F follows it backwards, and arrives at O, when R has receded to an infinite diſtance, and the ſeries is completed.

4. Let the incident light, moving in glaſs, fall on the concave ſurface of air, or come out of the convex ſurface of glaſs. Let it tend to a point R at an infinite diſtance without the glaſs. The refracted rays will converge to O, the principal focus without the glaſs. As the incident light is made more converging, R comes towards the glaſs, while F, ſetting out from *v*, alſo approaches the glaſs, and R overtakes it at the ſurface V. R now becomes a radiant point within the glaſs, receding backwards from the ſurface. F recedes ſlower at firſt, but overtakes R at the centre C, and paſſes it with an accelerated motion to an infinite diſtance; while R retreats to Q, the principal focus within the glaſs. R ſtill retreating, F appears before the glaſs; and while R retreats to an infinite diſtance, F comes to V, and the ſeries is completed.

§ 2. *Of Glaſſes.*

142
Lenſes how many.

Glaſs for optical purpoſes may be ground into nine different ſhapes. Glaſſes cut into five of thoſe ſhapes are called *lenſes*, which together with their axes are deſcribed in Vol. VI. page 33. (See Dioptrics). The other four are,

Plate CCLVI.

1. A *plane glaſs*, which is flat on both ſides, and of equal thickneſs in all its parts, as EF, fig. 1.

2. A *flat plano-convex*, whoſe convex ſide is ground into ſeveral little flat ſurfaces, as A, fig. 2.

3. A *priſm*, which has three flat ſides, and when viewed endwiſe appears like an equilateral triangle, as B.

4. A *concavo-convex* glaſs, as C, which has hitherto received no name, and is ſeldom, if ever, made uſe of in optical inſtruments.

A ray of light G*h* (fig. 1.) falling perpendicularly on a plane glaſs EF, will paſs through the glaſs in the ſame direction *hi*, and go out of it into the air in the ſame ſtraight line *i* H.

A ray of light AB falling obliquely on a plane glaſs, will go out of the glaſs in the ſame direction, but not in the ſame ſtraight line; for in touching the glaſs, it will be refracted in the line BC; and in leaving the glaſs, it will be refracted in the line CD.

Fig. 3. to 6.

Lemma. There is a certain point E within every double convex or double concave lens, through which every ray that paſſes will have its incident and emergent parts QA, *aq* parallel to each other: but in a plano-convex or plano-concave lens, that point E is removed to the vertex of the concave or convex ſurface; and in a meniſcus, and in that other concavo-convex lens, it is removed a little way out of them, and lies next to the ſurface which has the greateſt curvature.

For let RE*r* be the axis of the lens joining the centres R, *r* of its ſurfaces A, *a*. Draw any two of their ſemidiameters RA, *ra* parallel to each other, and join the point, A, *a*, and the line A*a* will cut the axis in the point E above deſcribed. For the triangles REA, *r*E*a* being equiangular, RE will be to E*r* in the given ratio of the ſemidiameters RA, *ra*; and conſequently the point E is invariable in the ſame lens. Now ſuppoſing a ray to paſs both ways along the line A*a*, it being equally inclined to the perpendiculars to the ſurfaces, will be equally bent, and contrariwiſe in going out of the lens; ſo that its emergent parts AQ, *aq* will be parallel. Now any of theſe lenſes will become plano-convex or plano-concave, by conceiving one of the ſemidiameters RA, *ra* to become infinite, and conſequently to become parallel to the axis of the lens, and then the other ſemidiameter will coincide with the axis; and ſo the points A, E or *a*, E will coincide. Q. E. D.

Corol. Hence when a pencil of rays falls almoſt perpendicularly upon any lens, whoſe thickneſs is inconſiderable, the courſe of the ray which paſſes through E, above deſcribed, may be taken for a ſtraight line paſſing through the centre of the lens without ſenſible error in ſenſible things. For it is manifeſt from the length of A*a*, and from the quantity of the refractions at its extremities, that the perpendicular diſtance of AQ, *aq* when produced, will be diminiſhed both as the thickneſs of the lens and the obliquity of the ray is diminiſhed.

PROPOSITION I.

To find the focus of parallel rays falling almoſt perpendicularly upon any given lens.

Fig. 7. to 12.

143
The focus of parallel rays falling perpendicularly upon any lens.

Let E be the centre of the lens, and *r* the centres of its ſurfaces, R*r* its axis, *g*EG a line parallel to the incident rays upon the ſurface B, whoſe centre is R. Parallel to *g*E draw a ſemidiameter BR, in which produced let V be the focus of the rays after their firſt refraction at the ſurface B, and joining V*r* let it cut *g*E produced in G, and G will be the focus of the rays that emerge from the lens.

For ſince V is alſo the focus of the rays incident upon the ſecond ſurface A, the emergent rays muſt have their focus in ſome point of that ray which paſſes ſtraight through this ſurface; that is, in the line V*r*, drawn through its centre *r*: and ſince the whole courſe of another ray is reckoned a ſtraight line *g*EG ‡, its interſection G with V*r* determines the focus of them all. Q. E. D.

‡ Corol. from Lemma.

Corol. 1. When the incident rays are parallel to the axis *r*R, the focal diſtance EF is equal to EG. For let the incident rays that were parallel to *g*E be gradually more inclined to the axis till they become parallel to it; and their firſt and ſecond focuſes V and G will deſcribe circular arches VT and GF whoſe centres are R and E. For the line RV is invariable; being in proportion to RB in a given ratio of the leſſer of the ſines of incidence and refraction to their difference§; conſequently the line EG is alſo invariable, being in proportion to the given line RV in the given ratio of *r*E to *r*R, becauſe the triangles EG*r*, RV*r* are equiangular.

§ By a former Prop.

Corol. 2. The laſt proportion gives the following rule for finding the focal diſtance of any thin lens. As R*r*, the interval between the centres of the ſurfaces, is to *r*E, the ſemidiameter of the ſecond ſurface, ſo is RV or RT, the continuation of the firſt ſemidiameter to the firſt focus, to EG or EF the focal diſtance of the lens; which, according as the lens is thicker or thinner in the middle than at its edges, muſt lie on the ſame ſide as the emergent rays, or on the oppoſite ſide.

Corol. 3. Hence when rays fall parallel on both ſides of any lens, the focal diſtances EF, Ef are equal. For let rt be the continuation of the ſemidiameter Er to the firſt focus t of rays falling parallel upon the ſurface A; and the ſame rule that gave rR to rE as RT to EF, gives alſo rR to RE as rt to Ef. Whence Ef and EF are equal, becauſe the rectangles under rE, RT and alſo under RE, rt are equal. For rE is to rt and alſo RE to RT in the ſame given ratio.

Corol. 4. Hence in particular in a double convex or double concave lens made of glaſs, it is as the ſum of their ſemidiameters (or in a meniſcus as their difference) to either of them, ſo is double the other, to the focal diſtance of the glaſs. For the continuations RT, rt are ſeverally double their ſemidiameters: becauſe in glaſs ET is to TR and alſo Et to tr as 3 to 2.

Corol. 5. Hence if the ſemidiameters of the ſurfaces of the glaſs be equal, its focal diſtance is equal to one of them; and is equal to the focal diſtance of a plano-convex or plano-concave glaſs whoſe ſemidiameter is as ſhort again. For conſidering the plane ſurface as having an infinite ſemidiameter, the firſt ratio of the laſt mentioned proportion may be reckoned a ratio of equality.

PROPOSITION II.

144 The focus of emergent rays found.

The focus of incident rays upon a ſingle ſurface, ſphere, or lens, being given, it is required to find the focus of the emergent rays.

Plate CCCLVII. fig. 1. to 6.

Let any point Q be the focus of incident rays upon a ſpherical ſurface, lens, or ſphere, whoſe centre is E; and let other rays come parallel to the line QEq the contrary way to the given rays, and after refraction let them belong to a focus F; then taking Ef equal to EF in the lens or ſphere, but equal to FC in the ſingle ſurface, ſay as QF to FE ſo Ef to fq; and placing fq the contrary way from f to that of FQ from F, the point q will be the focus of the refracted rays, without ſenſible error; provided the point Q be not ſo remote from the axis, nor the ſurfaces ſo broad as to cauſe any of the rays to fall too obliquely upon them.

For with the centre E and ſemidiameters EF and Ef deſcribe two arches FG, fg cutting any ray $QAaq$ in G and g, and draw EG and Eg. Then ſuppoſing G to be a focus of incident rays (as GA), the emergent rays (as agq) will be parallel to GE†; and on the other hand ſuppoſing g another focus of incident rays (as ga), the emergent rays (as AGQ) will be parallel to gE. Therefore the triangles QGE, Egq are equiangular, and conſequently QG is to GE as Eg to gq; that is, when the ray $QAaq$ is the neareſt to QEq, QF is to FE as Ef to fg. Now when Q accedes to F and coincides with it, the emergent rays become parallel, that is, q recedes to an infinite diſtance; and conſequently when Q paſſes to the other ſide of F, the focus q will alſo paſs through an infinite ſpace from one ſide of f to the other ſide of it. Q. E. D.

† By Corol. from former Prop.

Corol. 1. In a ſphere or lens the focus q may be found by this rule: As QF to QE ſo QE to Qq, to be placed the ſame way from Q as QF lies from Q.—For let the incident and emergent ray QA, qa be produced till they meet in e; and the triangles QGE, Qeq being equiangular, we have QG to QE as Qe to Qq; and when the angles of theſe triangles are vaniſhing, the point e will coincide with E; becauſe in the ſphere the triangle Aea is equiangular at the baſe Aa, and conſequently Ae and ae will at laſt become ſemidiameters of the ſphere. In a lens the thickneſs Aa is inconſiderable.

The focus may alſo be found by this rule;—$QF : FE :: QE : Eq$, for $QG : GE :: QA : Aq$.—And then the rule formerly demonſtrated for ſingle ſurfaces holds good for the lenſes.

Corol. 2. In all caſes the diſtance fq varies reciprocally as FQ does; and they lie contrariwiſe from f and F; becauſe the rectangle or the ſquare under EF and Ef, the middle terms in the foregoing proportions, is invariable.

The principal focal diſtance of a lens may not only be found by collecting the rays coming from the ſun, conſidered as parallel, but alſo (by means of this propoſition) it may be found by the light of a candle or window. For, becauſe $Qq : qA :: QE : EG$, we have (when A coincides with E) $Qq : qE = QE : EF$; that is, the diſtance obſerved between the radiant object and its picture in the focus is to the diſtance of the lens from the focus as the diſtance of the lens from the radiant is to its principal focal diſtance. Multiply therefore the diſtances of the lens from the radiant and focus, and divide the product by their ſum.

Corol. 3. Convex lenſes of different ſhapes that have equal focal diſtances, when put into each others places, have equal powers upon any pencil of rays to refract them to the ſame focus. Becauſe the rules abovementioned depend only upon the focal diſtance of the lens, and not upon the proportion of the ſemidiameters of its ſurfaces.

Corol. 4. The rule that was given for a ſphere of an uniform denſity, will ſerve alſo for finding the focus of a pencil of rays refracted through any number of concentric ſurfaces, which intercede uniform mediums of any different denſities. For when rays come parallel to any line drawn through the common centre of theſe mediums, and are refracted through them all, the diſtance of their focus from that centre is invariable, as in an uniform ſphere.

Corol. 5. When the focuſes Q, q lie on the ſame ſide of the refracting ſurfaces, if the incident rays flow from Q, the refracted rays will alſo flow from q; and if the incident rays flow towards Q, the refracted will alſo flow towards q: and the contrary will happen when Q and q are on contrary ſides of the refracting ſurfaces. Becauſe the rays are continually going forwards.

From this propoſition we alſo derive an eaſy method of drawing the progreſs of rays through any number of lenſes ranged on a common axis.

Let A, B, C, (fig. 7.) be the lenſes, and RA a ray incident on the firſt of them. Let α, β, κ, be their foci for parallel rays coming in the oppoſite direction; draw the perpendicular $\alpha\, d$, cutting the incident ray in d, and draw $d\, a$ through the centre of the lens: AB parallel to $d\, a$ will be the ray refracted by the firſt lens. Through the focus of the ſecond lens draw the perpendicular $\beta\, e$, cutting AB in *e*; and draw *e b* through the centre of the ſecond lens. BD parallel to *b e* will be the next refracted ray. Through the focus *x* of the third lens draw the perpendicular *x f*, cutting BD in *f*, and draw *f c* through the centre of the third lens. CE parallel to *f c*, will be the refracted ray; and ſo on.

§ 3. *Of Viſion.*

Having deſcribed how the rays of light, flowing from objects, and paſſing through convex glaſſes, are collected into points, and form the images of the objects; it will be eaſy to underſtand how the rays are affected by paſſing through the humours of the eye, and are thereby collected into innumerable points on the bottom of the eye, and thereon form the images of the objects which they flow from. For the different humours of the eye, and particularly the cryſtalline humour, are to be conſidered as a convex glaſs; and the rays in paſſing through them to be affected in the ſame manner as in paſſing through a convex glaſs. A deſcription of the coats and humours, &c. has been given at large in ANATOMY; but for the reader's convenience in this place, we ſhall repeat in a few words as much of the deſcription as will be ſufficient for our preſent purpoſe.

Plate CCCLVII. fig. 8.

145 Deſcription of the eye.

The eye is nearly globular. It conſiſts of three coats and three humours. The part DHHG of the outer coat, is called the *ſclerotica*; the reſt, DEFG, the *cornea*. Next within this coat is that called the *choroides*, which ſerves as it were for a lining to the other, and joins with the iris, *m n*, *m n*. The iris is compoſed of two ſets of muſcular fibres; the one of a circular form, which contracts the hole in the middle called the *pupil*, when the light would otherwiſe be too ſtrong for the eye; and the other of radical fibres, tending everywhere from the circumference of the iris towards the middle of the pupil; which fibres, by their contraction, dilate and enlarge the pupil when the light is weak, in order to let in the more of its rays. The third coat is only a fine expanſion of the optic nerve L, which ſpreads like net work all over the inſide of the choroides, and is therefore called the *retina*; upon which are painted (as it were) the images of all viſible objects, by the rays of light which either flow or are reflected from them.

Under the cornea is a fine tranſparent fluid like water, which is therefore called the *aqueous humour*. It gives a protuberant figure to the cornea, fills the two cavities *m m* and *n n*, which communicate by the pupil P; and has the ſame limpidity, ſpecific gravity, and refractive power, as water. At the back of this lies the cryſtalline humour II, which is ſhaped like a double convex glaſs; and is a little more convex on the back than the fore part. It converges the rays, which paſs through it from every viſible object to its focus at the bottom of the eye. This humour is tranſparent like cryſtal, is much of the conſiſtence of hard jelly, and exceeds the ſpecific gravity of water in the proportion of 11 to 10. It is encloſed in a fine tranſparent membrane, from which proceed radial fibres *o o*, called the *ligamentum ciliare* all around its edge; and join to the circumference of the iris.

At the back of the cryſtalline, lies the vitreous humour KK, which is tranſparent like glaſs, and is largeſt of all in quantity, filling the whole orb of the eye, and giving it a globular ſhape. It is much of a conſiſtence with the white of an egg, and very little exceeds the ſpecific gravity and refractive power of water.

146 The objects on the retina of the eye are inverted.

As every point of an object ABC, (*ibid.*) ſends out rays in all directions, ſome rays, from every point on the ſide next the eye, will fall upon the cornea between E and F; and by paſſing on through the humours and pupil of the eye, they will be converged to as many points on the retina or bottom of the eye, and will thereon form a diſtinct inverted picture *c b a*, of the object. Thus, the pencil of rays *q r s* that flows from the point A of the object, will be converged to the point *a* on the retina; thoſe from the point B will be converged to the point *b*; thoſe from the point C will be converged to the point *c*; and ſo of all the intermediate points: by which means the whole image *a b c* is formed, and the object made viſible. Although it muſt be owned, that the method by which this ſenſation is carried from the eye by the optic nerve to the common ſenſory in the brain, and there diſcerned, is above the reach of our comprehenſion.

But that viſion is effected in this manner, may be demonſtrated experimentally. Take a bullock's eye whilſt it is freſh; and having cut off the three coats from the back part, quite to the vitreous humour, put a piece of white paper over that part, and hold the eye towards any bright object, and you will ſee an inverted picture of the object upon the paper.

147 Why they are ſeen upright.

Since the image is inverted, many have wondered why the object appears upright. But we are to conſider, 1. That *inverted* is only a relative term: and, 2. That there is a very great difference between the real object and the means or image by which we perceive it. When all the parts of a diſtant proſpect are painted upon the retina, they are all right with reſpect to one another, as well as the parts of the proſpect itſelf; and we can only judge of an object's being inverted, when it is turned reverſe to its natural poſition with reſpect to other objects which we ſee and compare it with.—If we lay hold of an upright ſtick in the dark, we can tell which is the upper or lower part of it, by moving our hand downward or upward; and know very well that we cannot feel the upper end by moving our hand downward. Juſt ſo we find by experience, that upon directing our eyes towards a tall object, we cannot ſee its top by turning our eyes downward, nor its foot by turning our eyes upward; but muſt trace the object the ſame way by the eye to ſee it from head to foot, as we do by the hand to feel it; and as the judgment is informed by the motion of the hand in one caſe, ſo it is alſo by the motion of the eye in the other.

In fig. 9. is exhibited the manner of ſeeing the ſame object ABC, by both the eyes D and E at once.

148 An object when viewed with both eyes does not appear double, becauſe the optic nerve is inſenſible of light.

When any part of the image *c b a* falls upon the optic nerve L, the correſponding part of the object becomes inviſible. On which account, nature has wiſely placed the optic nerve of each eye, not in the middle of the bottom of the eye, but towards the ſide next the noſe; ſo that whatever part of the image falls upon the optic nerve of one eye, may not fall upon the optic nerve of the other. Thus the point *a* of the

image

Fig. 1.

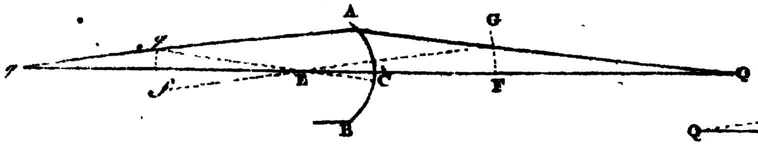


Fig. 2.

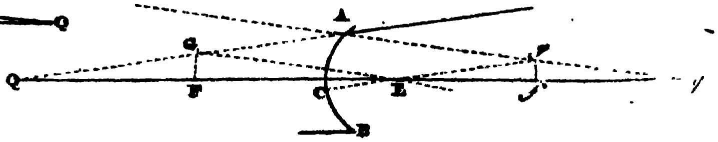


Fig. 3.

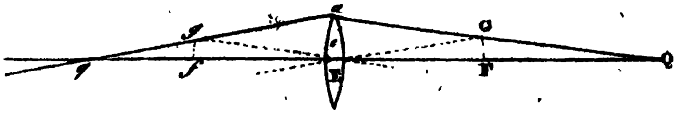


Fig. 4.

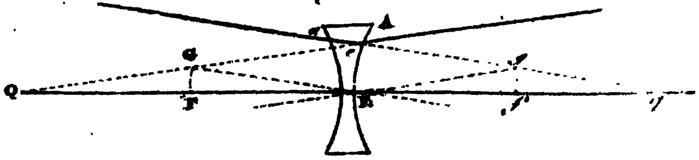


Fig. 5.

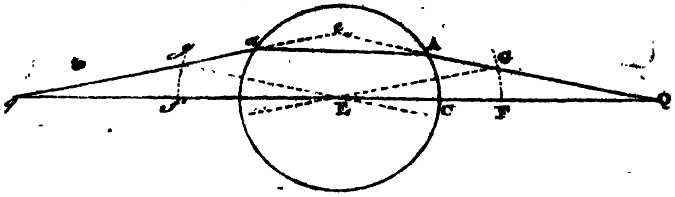


Fig. 6.

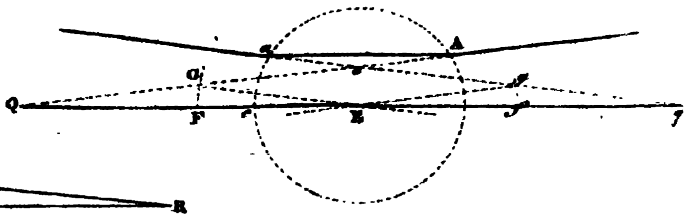


Fig. 7.

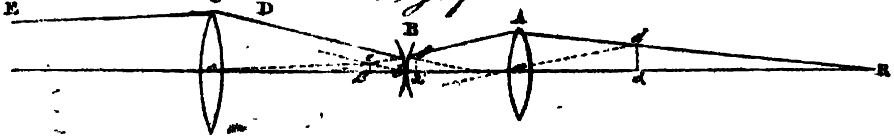


Fig. 8.

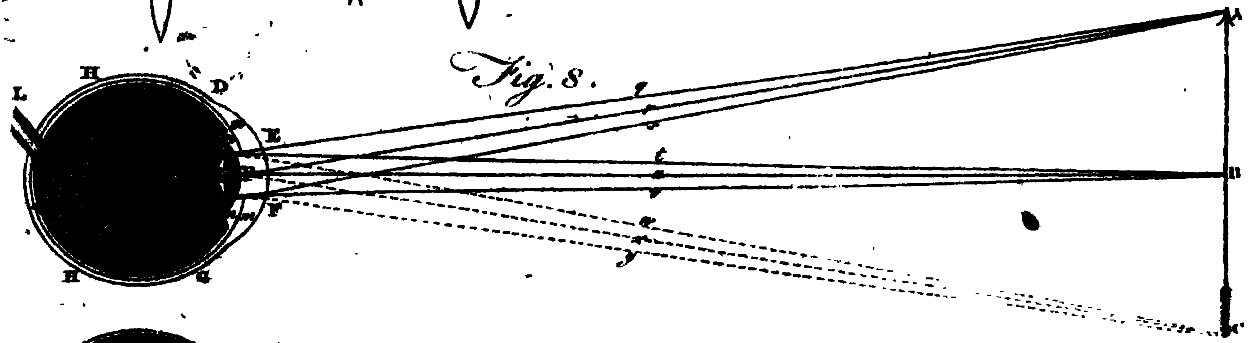
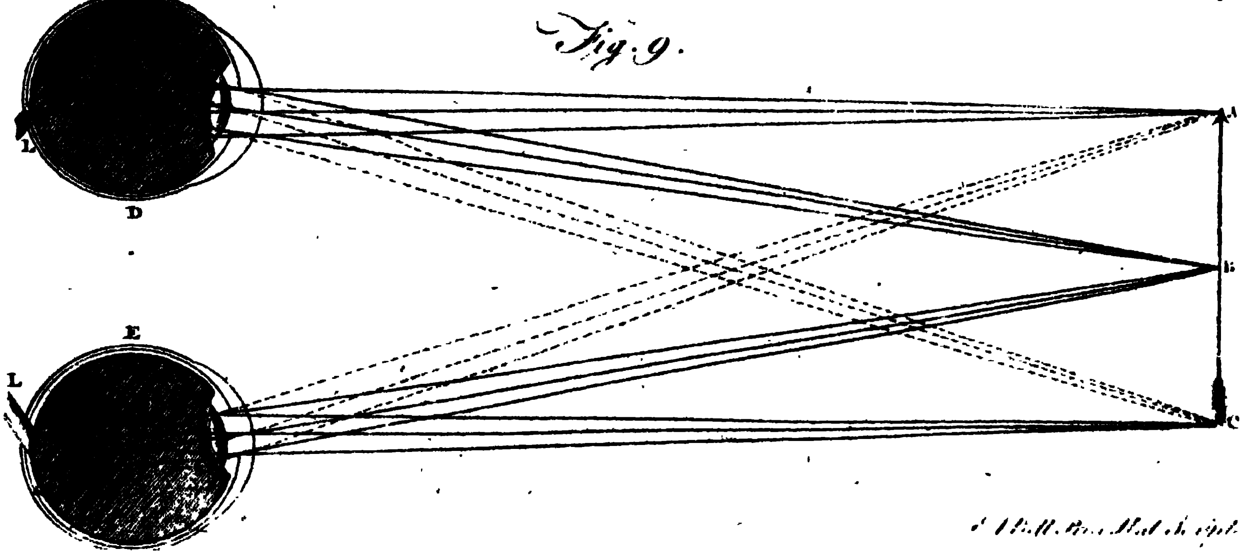


Fig. 9.



A. Bell Prin. Wal. Sculptor fecit.

image *c b a* falls upon the optic nerve of the eye D, but not of the eye E; and the point *c* falls upon the optic nerve of the eye E, but not of the eye D: and therefore, to both eyes taken together, the whole object ABC is viſible.

Plate CCCLVIII.

The nearer that any object is to the eye, the larger is the angle under which it is ſeen, and the magnitude under which it appears. Thus to the eye D, (fig. 1.) the object ABC is ſeen under the angle APC; and its image *c b a* is very large upon the retina: but to the eye E, at a double diſtance, the ſame object is ſeen under the angle A*p*C, which is equal only to half the angle APC, as is evident by the figure. The image *c b a* is likewiſe twice as large in the eye D, as the other image *c b a* is in the eye E. In both theſe repreſentations, a part of the image falls on the optic nerve, and the object in the correſponding part is inviſible.

As the ſenſe of ſeeing is allowed to be occaſioned by the impulſe of the rays from the viſible object upon the retina of the eye, and forming the image of the object thereon, and that the retina is only the expanſion of the optic nerve all over the choroides; it ſhould ſeem ſurpriſing, that the part of the image which falls on the optic nerve ſhould render the like part of the object inviſible; eſpecially as that nerve is allowed to be the inſtrument by which the impulſe and image are conveyed to the common ſenſory in the brain.

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Proved by experiment.

That the part of the image which falls upon the middle of the optic nerve is loſt, and conſequently the correſponding part of the object is rendered inviſible, is plain by experiment. For if a perſon fixes three patches, A, B, C, (fig. 2.) upon a white wall, at the height of the eye, and at the diſtance of about a foot from each other, and places himſelf before them, ſhutting the right eye, and directing the left towards the patch C, he will ſee the patches A and C, but the middle patch B will diſappear. Or, if he ſhuts his left eye, and directs the right towards A, he will ſee both A and C, but B will diſappear; and if he directs his eye towards B, he will ſee both B and A, but not C. For whatever patch is directly oppoſite to the optic nerve N, vaniſhes. This requires a little practice; after which he will find it eaſy to direct his eye ſo as to loſe the ſight of whichever patch he pleaſes.

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Diſpute concerning the ſeat of viſion.

This experiment, firſt tried by M. Marriotte, occaſioned a new hypotheſis concerning the ſeat of viſion, which he ſuppoſed not to be in the retina, but in the choroides. An improvement was afterwards made upon it by M. Picard, who contrived that an object ſhould diſappear when both the eyes were kept open. He faſtened upon a wall a round white paper, an inch or two in diameter; and by the ſide of it he fixed two marks, one on the right hand, and the other on the left, each at about 2 feet diſtance from the paper, and ſomewhat higher. He then placed himſelf directly before the paper, at the diſtance of 9 or 10 feet, and putting the end of his finger over againſt both his eyes, ſo that the left hand mark might be hid from the right eye, and the right hand mark from the left eye. Remaining firm in this poſture, and looking ſteadily, with both eyes, on the end of his finger, the paper which was not at all covered by it would totally diſappear. This, he ſays, is the more ſurpriſing, becauſe, without this particular encounter of the optic nerves, where no viſion is made, the paper will appear double, as is the caſe when the finger is not rightly placed.

M. Marriotte obſerves, that this improvement on his experiment, by M. Picard, is ingenious, but difficult to execute, ſince the eyes muſt be conſiderably ſtrained in looking at any object ſo near to them as four inches; and propoſes another not leſs ſurpriſing, and more eaſy. Place, ſays, he, on a dark ground, two round pieces of white paper, at the ſame height, and three feet from one another; then place yourſelf oppoſite to them, at the diſtance of 12 or 13 feet, and hold your thumb before your eyes, at the diſtance of about eight inches, ſo that it may conceal from the right eye the paper that is to the left hand, and from the left eye the paper to the right hand. Then, if you look at your thumb ſteadily with both eyes, you will loſe ſight of both the papers; the eyes being ſo diſpoſed, that each of them receives the image of one of the papers upon the baſe of the optic nerve, while the other is intercepted by the thumb.

M. Le Cat purſued this curious experiment a little farther than M. Marriotte had done. In the place of the ſecond paper, he fixed a large white board, and obſerved, that at a proper diſtance he loſt ſight of a circular ſpace in the centre of it. He alſo obſerved the ſize of the paper which is thus concealed from the ſight, correſponding to ſeveral diſtances, which enabled him to aſcertain ſeveral circumſtances relating to this part of the ſtructure of the eye more exactly than had been done before.

The manner in which this curious experiment is now generally made, and which is both the eaſieſt with reſpect to the eye, and the moſt indiſputable with reſpect to the fact, is the following. Let three pieces of paper be faſtened upon the ſide of a room, about two feet aſunder; and let a perſon place himſelf oppoſite to the middle paper, and, beginning near to it, retire gradually backwards, all the while keeping one of his eyes ſhut, and the other turned obliquely towards that outſide paper which is towards the covered eye, and he will find a ſituation (which is generally at about five times the diſtance at which the papers are placed from one another), where the middle paper will entirely diſappear, while the two outermoſt continue plainly viſible; becauſe the rays which come from the middle paper will fall upon the retina where the optic nerve is inſerted.

It will not ſurpriſe any perſon, even thoſe who are the ſtrongeſt advocates for the retina being the place at which the pencils of rays are terminated, and conſequently the proper ſeat of viſion, that M. Marriotte was led by this remarkable obſervation to ſuſpect the contrary. He not only did ſo; but, in conſequence of attentively conſidering the ſubject, a variety of other arguments in favour of the choroides occurred to him, particularly his obſervation, that the retina is tranſparent, as well as the cryſtalline and other humours of the eye, which he thought could only enable it to tranſmit the rays farther; and he could not perſuade himſelf that any ſubſtance could be conſidered as being the termination of the pencils, and the proper ſeat of viſion, at which the rays are not ſtopped in their progreſs.

He was farther confirmed in his opinion of the ſmall degree of ſenſibility in the retina, and of the greater ſenſibility of the choroides, by obſerving that the pupil dilates itſelf in the ſhade, and contracts itſelf in a great light; which involuntary motion, he thought, was a clear proof that the fibres of the iris are extremely ſenſible to the action of light; and this part of the eye is only a continuation of the choroides. He alſo thought that the dark colour of the choroides was intended to make it more ſuſceptible of the impreſſion of light.

M. Pecquet, in anſwer to M. Marriotte's obſervation concerning the tranſparency of the retina, ſays, that it is very imperfectly ſo, reſembling only oiled paper, or the horn that is uſed for lanterns; and beſides, that its whiteneſs demonſtrates it to be ſufficiently opaque for ſtopping the rays of light, as much as is neceſſary for the purpoſe of viſion; whereas, if viſion be performed by means of thoſe rays which are tranſmitted through ſuch a ſubſtance as the retina, it muſt be very indiſtinct.

As to the blackneſs of the choroides, which M. Marriotte thought to be neceſſary for the purpoſe of viſion, M. Pecquet obſerves, that it is not the ſame in all eyes, and that there are very different ſhades of it among the individuals of mankind, as alſo among birds, and ſome other animals, whoſe choroides is generally black; and that in the eyes of lions, camels, bears, oxen, ſtags, ſheep, dogs, cats, and many other animals, that part of the choroides which is the moſt expoſed to light, very often exhibits colours as vivid as thoſe of mother-of-pearl, or of the iris (F). He admits that there is a defect of viſion at the inſertion of the optic nerve; but he thought that it was owing to the blood veſſels of the retina, the trunks of which are ſo large in that place as to obſtruct all viſion.

To M. Pecquet's objection, founded on the opacity of the retina, M. Marriotte obſerves, that there muſt be a great difference betwixt the ſtate of that ſubſtance in living and dead ſubjects; and as a further proof of the tranſparency of the retina, and the power of the choroides beyond it to reflect light, he ſays, that if a lighted candle be held near to a perſon's eyes, and a dog, at the diſtance of eight or ten ſteps, be made to look at him, he would ſee a bright light in the dog's eyes, which he thought to proceed from the reflection of the light of the candle from the choroides of the dog, ſince the ſame appearance cannot be produced in the eyes of men, or other animals, whoſe choroides is black.

To M. Pecquet's remark concerning the blood veſſels of the retina, M. Marriotte obſerves, that they are not large enough to prevent viſion in every part of the baſe of the nerve, ſince the diameter of each of the two veſſels occupies no more than $\frac{1}{8}$th part of it. Beſides, if this were the cauſe of this want of viſion, it would vaniſh gradually, and the ſpace to which it is confined would not be ſo exactly terminated as it appears to be.

We muſt add, that M. Pecquet alſo obſerved, that notwithſtanding the inſenſibility of the retina at the inſertion of the optic nerve when the light is only moderate; yet that luminous objects, ſuch as a bright candle placed at the diſtance of four or five paces, do not abſolutely diſappear, in the ſame circumſtances in which a white paper would; for that this ſtrong light may be perceived though the picture fall on the baſe of the nerve. "I cannot help ſuſpecting, however, (ſays Dr Prieſtley), that M. Pecquet did not make this obſervation with ſufficient care. A large candle makes no impreſſion on that part of my eye, though it is by no means able to bear a ſtrong light."

The common opinion was alſo favoured by the anatomical deſcription of ſeveral animals by the members of the French academy, and particularly their account of the ſea calf and porcupine; in both of which the optic nerve is inſerted in the very axis of the eye, exactly oppoſite to the pupil, which was thought to leave no room to doubt, but that in theſe animals the retina is perfectly ſenſible to the impreſſion of light at the inſertion of the nerve. But this obſervation may deſerve to be reconſidered.

M. De la Hire took part with M. Pecquet, arguing in favour of the retina from the analogy of the ſenſes, in all of which the nerves are the proper ſeat of ſenſation. This philoſopher, however, ſuppoſed that the choroides receives the impreſſions of images, in order to tranſmit them to the retina.

M. Perrault alſo took the part of M. Pecquet againſt M. Marriotte, and in M. Perrault's works we have ſeveral letters that paſſed between theſe two gentlemen upon this ſubject.

This diſpute about the immediate inſtrument of viſion was revived upon the occaſion of an odd experiment of M. Mery, recorded in the Memoirs of the French Academy for 1704. He plunged a cat in water, and expoſing her eye to the ſtrong light of the ſun, obſerved that the pupil was not at all contracted by it; from which he concluded, that the contraction of the iris is not produced by the action of the light, but by ſome other circumſtance. For he contended that the eye receives more light in this ſituation than in the open air. At the ſame time he thought he obſerved that the retina of the cat's eye was tranſparent, and that he could ſee the opaque choroides beyond it: from which he concludes, that the choroides is the ſubſtance intended to receive the rays of light, and to be the chief inſtrument of viſion. But M. De la Hire replies to this argument of M. Mery, in a memoir for the year 1709, p. 119; in which he endeavours to ſhow that fewer rays enter the eye under water, and that in thoſe circumſtances it is not ſo liable to be affected by them. Beſides, it is obvious to be remarked, that the cat muſt be in great terror in this ſituation; and being an animal that has a very great voluntary power over the muſcles of the iris, and being now extremely attentive to every thing about her, ſhe might keep her eye open notwithſtanding

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(F) M. Muſſchenbroek ſays, that in many animals, as the lion, camel, bear, ox, ſtag, ſheep, dog, cat, and many birds, the choroides is not black, but blue, green, yellow, or ſome other colour. *Introductio*, Vol. II. p. 748.

ſtanding the action of the light upon it, and though it might be very painful to her. We are informed, that when a cat is placed in a window through which the ſun is ſhining, and conſequently her iris nearly cloſed, if ſhe hear a ruſtling, like that which is made by a mouſe, on the outſide of the window, ſhe will immediately open her eyes to their greateſt extent, without in the leaſt turning her face from the light.

M. Le Cat took part with M. Marriotte in this controverſy, it being peculiarly agreeable to his general hypotheſis, viz. that the pia mater, of which the choroides is a production, and not the nerves themſelves, is the proper inſtrument of ſenſation. He thought that the change which takes place in the eyes of old people (the choroides growing leſs black with age) favoured his hypotheſis, as they do not ſee with that diſtinctneſs with which young perſons do. M. Le Cat ſuppoſed that the retina anſwers a purpoſe ſimilar to that of the ſcarf-ſkin, covering the papillæ pyramidales, which are the immediate organs of feeling, or that of the porous membrane which covers the glandulous papillæ of the tongue. The retina, he ſays, receives the impreſſion of light, moderates it, and prepares it for its proper organ, but is not itſelf ſenſible of it.

It muſt be obſerved, that M. Le Cat had diſcovered that the pia mater, after cloſely embracing and conſtringing the optic nerve at its entrance into the eye, divides into two branches, one of which cloſely lines the cornea, and at length is loſt in it, while the ſecond branch makes what is called the *choroides*, or *uvea*. He alſo ſhowed that the ſclerotica is an expanſion of the dura mater; and he ſent diſſections of the eye to the Royal Academy of Sciences in 1739, to prove theſe aſſertions, and ſeveral others which he had advanced in his *Traité de Sens*, that were contrary to the opinions of the celebrated Winſlow.

To theſe arguments in favour of the choroides, alleged by thoſe gentlemen among whom the ſubject was firſt diſcuſſed, Dr Prieſtley in his hiſtory adds the following that had eſcaped their notice, but which were ſuggeſted to him by his friend Mr Michell.

In order that viſion be diſtinct, the pencils of rays which iſſue from the ſeveral points of any object, muſt be collected either accurately, or at leaſt very nearly, to correſponding points in the eye, which can only be done upon ſome uniform ſurface. But the retina being of a conſiderable thickneſs, and the whole of it being uniformly nervous, and at leaſt nearly, if not perfectly, tranſparent, preſents no particular ſurface; ſo that, in whatever part of it the pencils be ſuppoſed to have their foci, the rays belonging to them will be ſeparated from one another, either before or after they arrive there, and conſequently viſion would be confuſed.

If we ſuppoſe the ſeat of viſion to be at the nearer ſurface of the retina, and the images of objects to be formed by direct rays, a conſiderable degree of confuſion could not but ariſe from the light reflected by the choroides, in thoſe animals in which it is white, or coloured. On the other hand, it would be impoſſible that viſion ſhould be performed at this place by light reflected from the choroides, becauſe in many animals it is perfectly black, and reflects no light at all; and yet ſuch animals ſee even more diſtinctly than others. And we cannot but ſuppoſe that, in whatever manner viſion is effected, it is the ſame in the eyes of all animals.

If the ſeat of viſion be at the farther ſurface of the retina, and it be performed by direct rays, a white choroides could be of no uſe; and if it were by reflected rays, a black one could not anſwer the purpoſe.

It is likewiſe an argument in favour of the choroides being the organ of viſion, that it is a ſubſtance which receives a more diſtinct impreſſion from the rays of light than any other membrane in any part of the animal ſyſtem, excepting (and perhaps not excepting) that white cuticle which lies under the ſcales of fiſhes; whereas the retina is a ſubſtance on which the light makes an exceedingly faint impreſſion, and perhaps no impreſſion at all; ſince light, in paſſing out of one tranſparent medium into another immediately contiguous to it, ſuffers no refraction or reflection, nor are any of the rays abſorbed, unleſs there is ſome difference in the refracting power of the two media, which probably is not the caſe between the retina and the vitreous humour, which is in contact with it. And wherever the light is not affected by the medium it falls upon, we can hardly ſuppoſe the medium to receive any impreſſion from the light, the action being probably always mutual and reciprocal.

Beſides, the retina is ſo ſituated, as to be expoſed to many rays beſides thoſe which terminate in it, and which, therefore, cannot be ſubſervient to viſion, if it be performed there. Now this is not the caſe with the choroides, which is in no ſhape tranſparent, and has no reflecting ſubſtance beyond it.

It is, moreover, peculiarly favourable to the hypotheſis of the ſeat of viſion being in the choroides, that we can then ſee a ſufficient reaſon for the diverſity of its colour in different animals, according as they are circumſtanced with reſpect to viſion. In all terreſtrial animals, which have occaſion to make uſe of their eyes by night, the choroides is either of a bright white, or of ſome very vivid colour, which reflects the light very ſtrongly. On this account viſion may be performed with leſs light, but it cannot be with great diſtinctneſs, the reflection of the rays doubling their effect, ſince it muſt extend over ſome ſpace, all reflection being made at a diſtance from the reflecting body. Beſides, the choroides in brutes is not in general perfectly white, but a little inclined to blue; and is therefore, probably, better adapted to ſee by the fainter coloured light, which chiefly prevails in the night; and we would add, is on the ſame account more liable to be ſtrongly impreſſed by the colours to which they are chiefly expoſed.

On the other hand, the choroides of birds in general, eſpecially eagles, hawks, and other birds of prey, is black; by which means they are able to ſee with the greateſt diſtinctneſs, but only in bright day light. The owl, however, ſeeking her food by night, has the choroides white, like that of a cat. Laſtly, In the eyes of man, which are adapted to various uſes, the choroides is neither ſo black as that of birds, nor ſo white as that of thoſe animals who make the greateſt uſe of their eyes in the night.

As to a third hypotheſis, which is in effect that of M. De la Hire, which makes both the retina and the choroides equally neceſſary to viſion, and ſuppoſes it to be performed by the impreſſion of light on the choroides, communicated to the retina; Mr Michell obſerves, that the perceptions can hardly be ſuppoſed to be ſo acute, when the nerves, which are the chief inſtruments of ſenſation, do not receive the impreſſions immediately, but only after they have been communicated to another ſubſtance. Beſides, it muſt be more natural to ſuppoſe, that, when the principal impreſſion is made upon the choroides, it is communicated to the brain by its own proper nerves, which are abundantly ſufficient for the purpoſe.

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Dimenſions of the ſpot in the eye where there is no viſion.

Plate CCCLVIII

The dimenſions and preciſe form of the ſpot in the eye in which there is no viſion, were more accurately calculated by Daniel Bernouilli, in the following manner. He placed a piece of money O (fig. 3.) upon the floor; and then ſhutting one of his eyes, and making a pendulum to ſwing, ſo that the extremity of it might be nearly in the line AO, he obſerved at what place C it began to be inviſible, and where it again emerged into view at A. Raiſing the pendulum higher and lower, he found other points, as H, N, P, G, B, at which it began to be inviſible; and others, as M, L, E, A, at which it began to be viſible again; and drawing a curve through them, he found that it was elliptical; and, with reſpect to his own eye, the dimenſions of it were as follow; OC was 23, AC 10, BD 3, DH 13, and EG 14; ſo that the centre being at F, the greater axis was to the leſs as 8 to 7.

From theſe *data* the plane on which the figure was drawn being obliquely ſituated with reſpect to the eye, he found, that the place in the eye that correſponded to it was a circle, the diameter of which was a ſeventh part of the diameter of the eye, the centre of it being 27 parts of the diameter from the point oppoſite to the pupil, a little above the middle. He concludes with obſerving, that, in order that this ſpace in which there is no viſion may be as ſmall as poſſible, it is neceſſary that the nerve ſhould enter the eye perpendicularly, and that both this end, and alſo its entering the eye at a diſtance from its axis, are gained by the particular manner in which the two optic nerves unite and become ſeparate again, by croſſing one another.

In favour of one of the obſervations of Mr Michell, concerning the uſe of the choroides in viſion, Dr Prieſtley obſerves, that Aquapendente mentions the caſe of a perſon at Piſa, who could ſee very well in the night, but very little or none at all in the day time. This is alſo ſaid to be the caſe with thoſe white people among the blacks of Africa, and the inhabitants of the iſthmus of America, who, from this circumſtance, are called *moon-eyed*, Our author thinks it probable that their choroides is not of a dark colour, as it is in others of the human ſpecies; but white or light-coloured, as in thoſe animals which have moſt occaſion for their eyes in the night. See ALBINOS.

The following conſiderations in favour of the retina being the proper ſeat of viſion, are worthy of remark.

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Arguments for the retina's being the ſeat of viſion.

Dr Porterfield obſerves, that the reaſon why there is no viſion at the entrance of the optic nerve into the eye, may be, that it wants that ſoftneſs and delicacy which it has when it is expanded upon the choroides; and that, in thoſe animals in which that nerve is inſerted in the axis of the eye, it is obſerved to be equally delicate, and therefore probably equally ſenſible, in that place as in any other part of the retina. In general, the nerves, when conſtringed by their coats, have but little ſenſibility in compariſon of what they are endued with when they are diveſted of them, and unfolded in a ſoft and pulpy ſubſtance.

Haller obſerves, that the choroides cannot be the univerſal inſtrument of viſion, becauſe that ſometimes in men and birds, but eſpecially in fiſhes, it is covered internally with a black mucus, through which the rays cannot penetrate. This writer ſpeaks of a fibrous membrane in the retina diſtinct from its pulpy ſubſtance. On theſe fibres, he conjectures, that the images of objects are painted.

M. De la Hire's argument in favour of the retina, from the analogy of the ſenſes, is much ſtrengthened by conſidering that the retina is a large nervous apparatus, immediately expoſed to the impreſſion of light; whereas the choroides receives but a ſlender ſupply of nerves, in common with the ſclerotica, the conjunctiva, and the eyelids, and that its nerves are much leſs expoſed to the light than the naked fibres of the optic nerve. Indeed, from anatomical conſiderations, one might imagine that any other part of the body was as ſenſible of the impreſſion of light as the choroides.

That the optic nerve is of principal uſe in viſion, is farther probable from ſeveral phenomena attending ſome of the diſeaſes in which the ſight is affected. When an amauroſis has affected one eye only, the optic nerve of that eye has been found manifeſtly altered from its ſound ſtate. Dr Prieſtley was preſent when Mr Hey examined the brain of a young girl, who had been blind of one eye, and ſaw that the optic nerve belonging to it was conſiderably ſmaller than the other; and he informed him, that upon cutting into it, he found it to be much harder, and cineritious. Morgagni, indeed, mentions two caſes, in one of which he found the optic nerves ſmaller than uſual, and of a cineritious colour, when, upon inquiry, he was informed that the perſon had not been blind, though there might have been ſome defect in the ſight of one of the eyes. In the other caſe, only one of the optic nerves was affected in that manner, and the eye itſelf was in other reſpects very perfect. Here, alſo, he was expreſsly told, that the perſon was not blind of that eye; but it appears that he himſelf had not been acquainted with the perſons whom he diſſected; and there have been many caſes of perſons being blind of one eye, without knowing it themſelves, for a a conſiderable time.

Moreover, as the optic nerve is ſolely ſpent in forming the retina, ſo no function of the eye not immediately ſubſervient to viſion, is affected by an amauroſis. On the contrary, thoſe nerves which go to the choroides are found to retain, in this diſeaſe, their natural influence. The iris will contract in a recent gutta ſerena of one eye, if the other remains ſound, and is ſuddenly expoſed to a ſtrong light. The ſclerotis, conjunctiva, and eyelids, which receive their nerves from the ſame branches as the choroides, retain their ſenſibility in this diſorder.

The manner in which perſons recover from an amauroſis, favours the ſuppoſition of the ſeat of viſion being in the retina: ſince thoſe parts which are the moſt diſtant from the inſertion of the nerve recover their ſenſibility the ſooneſt, being in thoſe places the moſt pulpy and ſofteſt; whereas there is no reaſon to think that there is any difference in this reſpect in the different parts of the choroides. Mr Hey has been repeatedly informed, by perſons labouring under an imperfect amauroſis, or gutta ſerena, that they could not, when looking at any object with one eye, ſee it ſo diſtinctly when it was placed directly oppoſite to the pupil, as when it was ſituated ſomewhat obliquely. And thoſe perſons whom he had known to recover from a perfect amauroſis, firſt diſcovered the objects whoſe images fell upon that part of the retina which is at the greateſt diſtance from the optic nerve.

We ſhall conclude theſe remarks with obſerving, that if the retina be as tranſparent as it is generally repreſented to be, ſo that the termination of the pencils muſt neceſſarily be either upon the choroides, or ſome other opaque ſubſtance interpoſed between it and the retina, the action and reaction occaſioned by the rays of light being at the common ſurface of this body and the retina, both theſe mediums (ſuppoſing them to be equally ſenſible to the impreſſion of light) may be equally affected; but the retina, being naturally much more ſenſible to this kind of impreſſion, may be the only inſtrument by which the ſenſation is conveyed to the brain, though the choroides, or the black ſubſtance with which it is ſometimes lined, may alſo be abſolutely neceſſary for the purpoſe of viſion. Indeed when the reflection of the light is made at the common boundary of any two mediums, it is with no propriety that this effect is aſcribed to one of them rather than the other; and the ſtrongeſt reflections are often made back into the denſeſt mediums, when they have been contiguous to the rareſt, or even to a vacuum. This is not far from the hypotheſis of M. de la Hire, and will completely account for the entire defect of viſion at the inſertion of the optic nerve.

153 Of bright and obſcure viſion. Viſion is diſtinguiſhed into *bright* and *obſcure*, *diſtinct* and *confuſed*.—It is ſaid to be *bright*, when a ſufficient number of rays enter the pupil at the ſame time; *obſcure*, when too few. It is *diſtinct* when each pencil of rays is collected into a focus exactly upon the retina; *confuſed*, when they meet before they come at it, or when they would paſs it before they meet; for, in either of theſe laſt caſes, the rays flowing from different parts of the object will fall upon the ſame part of the retina, which muſt neceſſarily render the image confuſed and indiſtinct.—Now, that objects may appear with a due brightneſs, whether more or fewer rays proceed from them, we have a power of contracting or dilating the pupil, by means of the muſcular fibres of the iris, in order to take in more or fewer rays as occaſion requires. But this power has its limits. In ſome animals it is much greater than in others; particularly in ſuch as are obliged to ſeek their food by night as well as by day, as in cats, &c.

154 Of diſtinct viſion at different diſtances. That the rays may be collected into points exactly upon the retina, that is, that objects may appear *diſtinct*, whether they be nearer or farther off, *i, e.* whether the rays proceeding from them diverge more or leſs, we have a power of contracting or relaxing the *ligamenta ciliaria*, and thereby altering the form of the cryſtalline humour, and with it the focal diſtance of the rays. Thus when the object we view is far off, and the rays fall upon the pupil with a very ſmall degree of divergency, we contract the *ligamenta ciliaria*, which, being concave towards the vitreous humour, do thereby compreſs it more than otherwiſe they would do: by this means it is made to preſs harder upon the backſide of the cryſtalline humour, which is thereby rendered flatter; and thus the rays proceed farther before they meet in a focus, than otherwiſe they would have done. Add to this, that we dilate the pupils of our eyes (unleſs in caſes where the light is ſo ſtrong that it offends the eye), and thereby admit rays into them that are more diverging than thoſe which would otherwiſe enter. And, when the rays come from an object that is very near, and therefore diverge too much to be collected into their reſpective foci upon the retina, by relaxing the *ligamenta ciliaria*, we give the cryſtalline a more convex form, by which means the rays are made to ſuffer a proportionably greater degree of refraction in paſſing through it. Some philoſophers are of opinion that we do this by a power of altering the form of the eye; and others, by removing the cryſtalline forwards or backwards as occaſion requires: But neither of theſe opinions is probable; for the coats of the eye are too hard, in ſome animals, for the firſt; and, as to moving the cryſtalline out of its place, the cavities of the eye ſeem to be too well filled with the other humours to admit of ſuch removal.

Beſides this, in the caſe above-mentioned, by contracting the pupils of our eyes, we exclude the more diverging rays, and admit only ſuch as are more eaſily refracted into their reſpective foci (G). But viſion is not diſtinct at all diſtances, for our power of contracting and relaxing the *ligamenta ciliaria* is alſo circumſcribed within certain limits.

155 Of ſhort-ſighted and long-ſighted people. In thoſe eyes where the tunica cornea is very protuberant and convex, the rays of light ſuffer a very conſiderable refraction at their entrance into the aqueous humour, and are therefore collected into a focus before they fall upon the retina, unleſs the object be placed very near, ſo that the rays which enter the eye may have a conſiderable degree of divergency. People that have ſuch eyes are ſaid to be *purblind*. Now, the nearer an object is to the eye, the greater is the image of it therein, as explained above: theſe people, therefore can ſee much ſmaller objects than others, as ſeeing much nearer ones with the ſame diſtinctneſs; and their ſight continues good longer than that of other people, becauſe the tunica cornea of their eyes, as they grow old, becomes plainer, for want of that redundancy of humours with which they were filled before. On the contrary, old men having the cornea of their eyes too flat for want of a ſufficient quantity of the aqueous humour to fill them out, if the rays diverge

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(G) Accordingly it is obſerved, that if we make a ſmall hole with the point of a needle through a piece of paper, and apply that hole cloſe to the eye, making uſe of it, as it were, inſtead of a pupil, we ſhall be able to ſee an object diſtinctly through it, though the object be placed within half an inch of the eye

Of Viſion.

too much before they enter the eye, they cannot be brought to a focus before they reach the retina: on which account thoſe people cannot ſee diſtinctly, unleſs the object be ſituated at a greater diſtance from the eye than is required for thoſe whoſe eyes are of a due form. The latter require the aſſiſtance of convex glaſſes to make them ſee objects diſtinctly; the former of concave ones. For if either the cornea *a b c* (fig. 4.), or cryſtalline humour *e*, or both of them, be too flat, as in the eye A, their focus will not be on the retina as at A, where it ought to be, in order to render viſion diſtinct; but beyond the eye, as at *f*. This is remedied by placing a convex glaſs *g h* before the eye, which makes the rays converge ſooner, and imprints the image duly on the retina at *d*. Again, If either the cornea, or cryſtalline humour, or both of them, be too convex, as in the eye B, the rays that enter it from the object C will be converged to a focus in the vitreous humour, as at *f*; and by diverging from thence to the retina, will form a very confuſed image thereon; and ſo of courſe, the obſerver will have as confuſed a view of the object as if his eye had been too flat. This inconvenience is remedied by placing a concave glaſs *g h* before the eye; which glaſs, by cauſing the rays to diverge between it and the eye, lengthens the focal diſtance ſo, that if the glaſs be properly choſen, the rays will unite at the retina, and form a diſtinct image of the object upon it.

Plate CCCLVIII.

156 Of the leaſt angle of viſion.

Such eyes as are of a due convexity, cannot ſee any object diſtinctly at leſs diſtance than ſix inches; and there are numberleſs objects too ſmall to be ſeen at that diſtance, becauſe they cannot appear under any ſenſible angle.—Concerning the leaſt angle under which any object is viſible, there was a debate between Dr Hooke and Hevelius. The former aſſerted that no object could well be ſeen if it ſubtended an angle leſs than one minute; and, if the object be round as a black circular ſpot upon a white ground, or a white circle upon a black ground, it follows, from an experiment made by Dr Smith, that this is near the truth; and from thence he calculates, that the diameter of the picture of ſuch leaſt viſible point upon the retina is the 8000th part of an inch; which he therefore calls a *ſenſible point of the retina*. On the other hand, Mr Courtivron concluded from his experiments, that the ſmalleſt angle of viſion was 40 ſeconds. According to Dr Jurin, there are caſes in which a much ſmaller angle than one minute can be diſcerned by the eye; and in order to throw light upon the ſubject, he obſerves, that in order to our perceiving the impreſſion made by any object upon our ſenſes, it muſt either be of a certain degree of force, or of a certain degree of magnitude. For this reaſon, a ſtar, which appears only as a lucid point through a teleſcope ſubtending not ſo much as an angle of one ſecond, is viſible to the eye; though a white or black ſpot of 25 or 30 ſeconds, is not to be perceived.

157 Lines can be ſeen under ſmaller angles than ſpots, and why.

Alſo a line of the ſame breadth with the circular ſpot will be viſible at ſuch a diſtance as the ſpot is not to be perceived at; becauſe the quantity of impreſſion from the line is much greater than from the ſpot; and a longer line is viſible at a greater diſtance than a ſhorter one of the ſame breadth. He found by experience, that a ſilver wire could be ſeen when it ſubtended an angle of three ſeconds and a half; and that a ſilk thread could be ſeen when it ſubtended an angle of two ſeconds and an half.

This greater viſibility of a line than of a ſpot ſeems to ariſe only from the greater quantity of the impreſſion; but without the limits of perfect viſion, our author obſerves, that another cauſe concurs, whereby the difference of viſibility between the ſpot and the line is rendered much more conſiderable. For the impreſſion upon the retina made by the line is then not only much greater, but alſo much ſtronger, than that of the ſpot; becauſe the faint image, or penumbra, of any one point of the line, when the hole is placed beyond the limits of diſtinct viſion, will fall within the faint image of the next point, and thereby much increaſe the light that comes from it.

In ſome caſes our author found the cauſe of indiſtinct viſion to be the unſteadineſs of the eye; as our being able to ſee a ſingle black line upon a white ground, or a ſingle white line upon a black ground, and not a white line between two black ones on a white ground. In viewing either of the former objects, if the eye be imperceptibly moved, all the effect will be, that the object will be painted upon a different part of the retina; but wherever it is painted, there will be but one picture, ſingle and uncompounded with any other. But in viewing the other, if the eye fluctuate ever ſo little, the image of one or other of the black lines will be ſo ſhifted to that part of the retina which was before poſſeſſed by the white line; and this muſt occaſion ſuch a dazzle in the eye, that the white line cannot be diſtinctly perceived, and diſtinguiſhed from the black lines; which, by a continual fluctuation, will alternately occupy the ſpace of the white line, whence muſt ariſe an appearance of one broad dark line, without any manifeſt ſeparation.

By trying this experiment with two pins of known diameters, ſet in a window againſt the ſky light, with a ſpace between them equal in breadth to one of the pins, he found that the diſtance between the pins could hardly be diſtinguiſhed when it ſubtended an angle of leſs than 40 ſeconds, though one of the pins alone could be diſtinguiſhed when it ſubtended a much leſs angle. But though a ſpace between two pins cannot be diſtinguiſhed by the eye when it ſubtends an angle leſs than 40 ſeconds, it would be a miſtake to think that the eye muſt neceſſarily commit an error of 40 ſeconds in eſtimating the diſtance between two pins when they are much farther from one another. For if the ſpace between them ſubtend an angle of one minute, and each of the pins ſubtend an angle of four ſeconds which is greater than the leaſt angle the eye can diſtinguiſh, it is manifeſt that the eye may judge of the place of each pin within two ſeconds at the moſt; and conſequently the error committed in taking the angle between them cannot at the moſt exceed four ſeconds, provided the inſtrument be ſufficiently exact. And yet, ſays he, upon the like miſtake was founded the principal objection of Dr Hooke againſt the accuracy of the celeſtial obſervations of Hevelius.

A black ſpot upon a white ground, or white ſpot upon a black ground, he ſays can hardly be perceived by the generality of eyes when it ſubtends a leſs angle than one minute. And if two black ſpots be made upon white paper, with a ſpace between them equal in breadth to one of their diameters, that ſpace is not to be diſtinguiſhed, even within the limits of perfect viſion, under ſo ſmall an angle as a ſingle ſpot of the ſame ſize can be diſtinguiſhed. To ſee the two ſpots diſtinctly, therefore, the breadth of the ſpace between them muſt ſubtend an angle of more than a minute. It would be very difficult, he ſays, to make this experiment accurately, within the limits of perfect viſion; becauſe the objects muſt be extremely ſmall: but by a rude trial, made with ſquare bits of white paper, placed upon a black ground, he judged, that the leaſt angle under which the interval of two objects could be perceived, was at leaſt a fourth part greater than the leaſt angle under which a ſingle object can be perceived. So that an eye which cannot perceive a ſingle object under a ſmaller angle than one minute, will not perceive the interval between two ſuch objects under a leſs angle than 75 ſeconds.

Without the limits of perfect viſion, the diſtance at which a ſingle object ceaſes to be perceivable will be much greater in proportion than the diſtance at which a ſpace of equal breadth between two ſuch objects ceaſes to be perceivable. For, without theſe limits, the image of each of the objects will be attended with a penumbra, and the penumbra of the two near objects will take up part of the ſpace between them, and thereby render it leſs perceivable; but the penumbra will add to the breadth of the ſingle object, and will thereby make it more perceivable, unleſs its image be very faint. Upon the ſame principles he likewiſe accounts for the radiation of the ſtars, whereby the light ſeems to project from them different ways at the ſame time.

Mr Mayer made many experiments in order to aſcertain the ſmalleſt angle of viſion in a variety of reſpects. He began with obſerving at what diſtance a black ſpot was viſible on white paper; and found, that when it could barely be diſtinguiſhed, it ſubtended an angle of about 34 ſeconds. When black lines were diſpoſed with intervals broader than themſelves, they were diſtinguiſhed at a greater diſtance than they could be when the objects and the intervals were of an equal breadth. In all theſe caſes it made no difference whether the objects were placed in the ſhade or in the ſtrong light of the ſun; but when the degrees of light were ſmall, their differences had a conſiderable effect, though by no means in proportion to the differences of the light. For if an object was illuminated to ſuch a degree as to be juſt viſible at the diſtance of nine feet, it would be viſible at the diſtance of four feet, though the light was diminiſhed above 160 times. It appeared in the courſe of theſe experiments, that common day light is, at a medium, equal to that of 25 candles placed at the diſtance of one foot from the object.

158
Of ſingle viſion with two eyes.

As an image of every viſible object is painted on the retina of each of our eyes, it thence becomes a natural queſtion, Why we do not ſee every thing double? It was the opinion of Sir Iſaac Newton and others, that objects appear ſingle becauſe the two optic nerves unite before they reach the brain. But Dr Porterfield ſhows, from the obſervation of ſeveral anatomiſts, that the optic nerves do not mix, or confound their ſubſtance, being only united by a cloſe cohesion; and objects have appeared ſingle where the optic nerves were found to be disjoined.

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Solutions of this difficulty by Dr Briggs.

Dr Briggs ſuppoſed that ſingle viſion was owing to the equal tenſion of the correſponding parts of the optic nerves, whereby they vibrated in a ſynchronous manner. But, beſides ſeveral improbable circumſtances in this account, Dr Porterfield ſhows that facts do by no means favour it.

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Dr Porterfield.

To account for this phenomenon, this ingenious writer ſuppoſes, that by an original law in our natures, we imagine objects to be ſituated ſomewhere in a right line drawn from the picture of it upon the retina, through the centre of the pupil. Conſequently, the ſame object appearing to both eyes to be in the ſame place, the mind cannot diſtinguiſh it into two. In anſwer to an objection to this hypotheſis, from objects appearing double when one eye is diſtorted, he ſays the mind miſtakes the poſition of the eye, imagining that it had moved in a manner correſponding to the other, in which caſe the concluſion would have been juſt. In this he ſeems to have recourſe to the power of habit, though in words he diſclaims that hypotheſis.

This principle, however, has generally been thought to be ſufficient to account for this appearance. Originally, every object making two pictures, one in each eye, is imagined to be double; but by degrees, we find, that when two correſponding parts of the retina are impreſſed, the object is but one; but if thoſe correſponding parts be changed, by the diſtortion of one of the eyes, the object muſt again appear double as at the firſt. This ſeems to be verified by Mr Cheſelden; who informs us, that a gentleman, who from a blow on his head had one eye diſtorted, found every object to appear double; but by degrees the moſt familiar ones came to appear ſingle again, and in time all objects did ſo, without any amendment of the diſtortion. A caſe ſimilar to this is mentioned by Dr Smith.

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Dr Reid, and

On the other hand, Dr Reid is of opinion, that the correſpondence of the centres of the two eyes, on which ſingle viſion depends, does not ariſe from cuſtom, but from ſome natural conſtitution of the eye and of the mind. He makes ſeveral juſt objections to the caſe of Mr Foſter, recited by Dr Smith and others; and thinks that the caſe of the young man couched by Cheſelden, who ſaw ſingly with both eyes immediately upon receiving his ſight, is nearly deciſive in proof of his ſuppoſition. He alſo found that three young gentlemen, whom he endeavoured to cure of ſquinting, ſaw objects ſingly, as ſoon as ever they were brought to direct the centres of both their eyes to the ſame object, though they had never been uſed to do ſo from their infancy; and he obſerves, that there are caſes, in which, notwithſtanding the fulleſt conviction of an object being ſingle, no practice of looking at it will ever make it appear ſo, as when it is ſeen through a multiplying glaſs.

To all theſe ſolutions of the difficulty reſpecting ſingle viſion by both eyes, objections have been lately made which ſeem inſurmountable. By experiments judiciouſly conceived and accurately conducted, Dr Wells has ſhown, that it is neither by cuſtom alone, nor by the original property of the eyes alone, that objects appear ſingle; and having demoliſhed the theories of others, he thus accounts for the phenomenon himſelf.

162 Dr Wells.

“The viſible place of an object being compoſed of its viſible diſtance and viſible direction, to ſhow how it may appear the ſame to both eyes, it will be neceſſary (ſays he *) to explain in what manner the diſtance and direction, which are perceived by one eye, may coincide with thoſe which are perceived by the other.” With reſpect to viſible diſtance, the author's opinion ſeems not to differ from that which we have ſtated elſewhere (ſee METAPHYSICS, N° 49, 50); and therefore we have to attend only to what he ſays of viſible direction.

When a ſmall object is ſo placed with reſpect to either eye, as to be ſeen more diſtinctly than in any other ſituation, our author ſays that it is then in the *optic axis*, or the axis of that eye. When the two optic axes are directed to a ſmall object not very diſtant, they may be conceived to form two ſides of a triangle, of which the baſe is the interval between the points of the corners where the axes enter the eyes. This baſe he called the *viſual baſe;* and a line drawn from the middle of it to the point of interſection of the optic axis he calls the *common aixs*. He then proceeds to ſhow, that objects *really ſituated* in the *optic* axis do not *appear* to be in that line, but in the *common axis*.

“Every perſon (ſays he) knows, that if an object be viewed through two ſmall holes, one applied to each eye, the two holes appear but as one. The theories thitherto invented afford two explanations of this fact. According to Aguilonius, Dechales, Dr Porterfield, and Dr Smith, the two holes, or rather their borders, will be ſeen in the ſame place as the object viewed through them, and will conſequently appear united, for the ſame reaſon that the object itſelf is ſeen ſingle. But whoever makes the experiment will diſtinctly perceive, that the united hole is much nearer to him than the object; not to mention, that any fallacy on this head might be corrected by the information from the ſenſe of touch, that the card or other ſubſtance in which the holes have been made is within an inch or leſs of our face. The other explanation is that furniſhed by the theory of Dr Reid. According to it, the centres of the retinas, which in this experiment receive the pictures of the holes, will, by an original property, repreſent but one. This theory, however, though it makes the two holes to appear one, does not determine where this one is to be ſeen. It cannot be ſeen in only one of the perpendiculars to the images upon the retinas, for no reaſon can be given why this law, of viſible direction, which Dr Reid thinks eſtabliſhed beyond diſpute, if it operates at all, ſhould not operate upon both eyes at the ſame time; and if it be ſeen by both eyes in ſuch lines, it muſt appear where thoſe lines croſs each other, that is, in the ſame place with the object viewed through the holes, which, as I have already mentioned, is contrary to experience. Nor is it ſeen in any direction, the conſequence of a law affecting both eyes conſidered as one organ, but ſuſpended when each eye is uſed ſeparately. For when the two holes appear one, if we pay attention to its ſituation, and then cloſe one eye, the truly ſingle hole will be ſeen by the eye remaining open in exactly the ſame direction as the apparently ſingle hole was by both eyes.

“Hitherto I have ſuppoſed the holes almoſt touching the face. But they have the ſame unity of appearance, in whatever parts of the optic axes they are placed; whether both be at the ſame diſtance from the eyes, or one be cloſe to the eye in the axis of which it is, and the other almoſt contiguous to the object ſeen through them. If a line, therefore, be drawn from the object to one of the eyes, it will repreſent all the real or tangible poſitions of the hole, which allow the object to be ſeen by that eye, and the whole of it will coincide with the optic axis. Let a ſimilar line be drawn to the other eye, and the two muſt appear but as one line; for if they do not, the two holes in the optic axes will not, at every diſtance, appear one, whereas experiments prove that they do. This united line will therefore repreſent the viſible direction of every object ſituated in either of the optic axes. But the end of it, which is toward the face, is ſeen by the right eye to the left, and by the left eye as much to the right. It muſt be ſeen then in the middle between the two, and conſequently in the common axis. And as its other extremity coincides with the point where the optic axes interſect each other, the whole of it muſt lie in the common axis. Hence the truth of the propoſition is evident, that objects ſituated in the optic axis, do not appear to be in that line, but in the common axis.”

He then proves by experiments, for which we muſt refer to his work, that objects ſituated in the common axis do not *appear* to be in that line, but in the axis of the eye by which they are not ſeen: that is, an object ſituated in the common axis appears to the right eye in the axis of the left, and *vice verſa*. His next propoſition, proved likewiſe by experiments, is, that “objects, ſituated in any line drawn through the mutual interſection of the optic axes to the viſual baſe, do not appear to be in that line, but in another, drawn through the ſame interſection, to a point in the viſual baſe diſtant half this baſe from the ſimilar extremity of the former line towards the left, if the objects be ſeen by the right eye, but towards the right if ſeen by the left eye.”

From theſe propoſitions he thus ſatisfactorily accounts for ſingle viſion by both eyes. “If the queſtion be concerning an object at the concourſe of the optic axes, it is ſeen ſingle, becauſe its two ſimilar appearances, in regard to ſize, ſhape, and colour, are ſeen by both eyes in one and the ſame direction, or if you will, in two directions, which coincide with each other through the whole of their extent. It therefore matters not whether the diſtance be truly or falſely eſtimated; whether the object be thought to touch our eyes, or to be infinitely remote. And hence we have a reaſon, which no other theory of viſible direction affords, why objects appeared ſingle to the young gentleman mentioned by Mr Cheſelden, immediately after his being couched, and before he could have learned to judge of diſtance by ſight.

“When two ſimilar objects are placed in the optic axes, one in each, at equal diſtances from the eyes, they will appear in the ſame place, and therefore one, for the ſame reaſon that a truly ſingle object, in the concourſe of the optic axes, is ſeen ſingle.

“To finiſh this part of my ſubject, it ſeems only neceſſary to determine, whether the dependence of viſible direction upon the actions of the muſcles of the eyes be eſtabliſhed by nature, or by cuſtom. But facts are here wanting. As far as they go, however, they ſerve to prove that it ariſes from an original principle of our conſtitution. For Mr Cheſelden's patient ſaw objects ſingle, and conſequently in the ſame directions with both eyes, immediately after he was couched; and perſons affected with ſquinting from their earlieſt infancy ſee objects in the ſame directions with the eye they have never been accuſtomed to employ, as they do with the other they have conſtantly uſed."

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* Eſſay on ſingle Viſion, &c.

The author removes many difficulties, and obviates the objections to which his theory may ſeem moſt liable. The whole work deſerves to be attentively ſtudied by every optician; and we therefore recommend it to the peruſal of our readers.

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Objects ſeen with both eyes appear brighter than when ſeen with only one.

We are indebted to Dr Jurin for the following curious experiments, to determine whether an object ſeen by both eyes appears brighter than when ſeen with one only.

He laid a ſlip of clean white paper directly before him on a table, and applying the ſide of a book cloſe to his right temple, ſo as that the book was advanced conſiderably more forward than his face, he held it in ſuch a manner, as to hide from his right eye that half of the paper which lay to his left hand, while the left half of the paper was ſeen by both eyes, without any impediment.

Then looking at the paper with both eyes, he obſerved it to be divided, from the top to the bottom, by a dark line, and the part which was ſeen with one eye only was manifeſtly darker than that which was ſeen with both eyes; and, applying the book to his left temple, he found, by the reſult of the experiment, that both his eyes were of equal goodneſs.

He then endeavoured to find to what degree this exceſs of brightneſs amounted; and comparing it with the appearance of an object illuminated partly by one candle and partly by two, he was ſurpriſed to find that an object ſeen with two eyes is by no means twice as luminous as when it is ſeen with one only; and after a number of trials, by which he made the proportion leſs and leſs continually, he found, that when one paper was illuminated by a candle placed at the diſtance of three feet, and another paper by the ſame candle at the ſame diſtance, and by another candle at the diſtance of 11 feet, the former ſeen by both eyes, and the latter with one eye only, appeared to be of equal whiteneſs; ſo that an object ſeen with both eyes appears brighter than when it is ſeen with one only by about a 13th part. But he acknowledges, that it is difficult to make this experiment exactly.

He then proceeded to inquire, whether an object ſeen with both eyes appears any thing larger than when ſeen with one only; but he concluded that it did not, except on account of ſome particular circumſtances, as in the caſe of the binocular teleſcope and the concave ſpeculum.

M. du Tour maintains, that the mind attends to no more than the image made in one eye at a time; and produces ſeveral curious experiments in favour of this hypotheſis, which had alſo been maintained by Kepler and almoſt all the firſt opticians. But, as M. Buffon obſerves, it is a ſufficient anſwer to this hypotheſis, how ingeniouſly ſoever it may be ſupported, that we ſee more diſtinctly with two eyes than with one; and that when a round object is near us, we plainly ſee more of the ſurface in one caſe than in the other. There are alſo other facts which clearly prove the contrary of what is maintained by M. du Tour.

With reſpect to ſingle viſion with two eyes, Dr Hartley obſerves, that it deſerves particular attention, that the optic nerves of men, and ſuch other animals as look the ſame way with both eyes, unite in the *cella turcica* in a ganglion, or little brain, as one may call it, peculiar to themſelves; and that the aſſociations between ſynchronous impreſſions on the two retinas muſt be made ſooner and cemented ſtronger on this account: alſo that they ought to have a much greater power over one another's images, than in any other part of the body. And thus an impreſſion made on the right eye alone, by a ſingle object, may propagate itſelf into the left, and there raiſe up an image almoſt equal in vividneſs to itſelf; and conſequently when we ſee with one eye only, we may, however, have pictures in both eyes.

A curious deception in viſion, ariſing from the uſe of both eyes, was obſerved and accounted for by Dr Smith. It is a common obſervation, he ſays, that objects ſeen with both eyes appear more vivid and ſtronger than they do to a ſingle eye; eſpecially when both of them are equally good. A perſon not ſhort ſighted may ſoon be convinced of this fact, by looking attentively at objects that are pretty remote, firſt with one eye, and then with both. This obſervation gave occaſion to the conſtruction of the binocular teleſcope, in the uſe of which the phenomenon is ſtill more ſtriking.

Beſides this, our author obſerves, that there is another phenomenon obſervable with this inſtrument, which is very remarkable. In the foci of the two teleſcopes there are two equal rings, as uſual, which terminate the pictures of the objects there formed, and conſequently the viſible area of the objects themſelves. Theſe equal rings, by reaſon of the equal eye-glaſſes, appear equal, and equally diſtant when ſeen ſeparately by each eye; but when they are ſeen with both eyes, they appear much larger, and more diſtant alſo; and the objects ſeen through them do alſo appear much larger, though circumſcribed by their united rings, in the ſame places as when they were ſeen ſeparately.

He obſerves that the phenomenon of the enlarged circle of the viſible area in the binocular teleſcope, may be ſeen very plainly in looking at diſtant objects through a pair of ſpectacles, removed from the eyes about four or five inches, and held ſteady at that diſtance. The two innermoſt of the four apparent rings, which hold the glaſſes, will then appear united in one larger and more diſtant ring than the two outermoſt, which will hardly be viſible unleſs the ſpectacles be farther removed.

A curious circumſtance relating to the effect of one eye upon the other, was noticed by M. Æpinus, who obſerved, that, when he was looking through a hole made in a plate of metal, about the 10th part of a line in diameter, with his left eye, both the hole itſelf appeared larger, and alſo the field of view ſeen through it was more extended, whenever he ſhut his right eye; and both theſe effects were more remarkable when that eye was covered with his hand. He found conſiderable difficulty in meaſuring this augmentation of the apparent diameter of the hole, and of the field of view; but at length he found, that, when the hole was half an inch, and the tablet which he viewed through it was three feet from his eye, if the diameter of the field when both his eyes were open was 1, it became 1½ when the other eye was ſhut, and nearly 2 when his hand was laid upon it.

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When one eye is cloſed, the pupil of the other is enlarged.

Upon examining this pheuomenon, it preſently appeared to depend upon the enlargement of the pupil of one eye when the other is cloſed, the phyſical or anatomical cauſe of which he did not pretend to aſſign; but he obſerves, that it is wiſely appointed by divine Providence, in order that when one eye fails, the field of view in the other may be extended. That this effect ſhould be more ſenſible when the eye is covered with the hand, is owing, he obſerves, to the eyelids not being impervious to the light. But the enlargement of the pupil does not enlarge the field of view, except in looking through a hole, as in this particular caſe; and therefore perſons who are blind of one eye can derive no advantage from this circumſtance. Before we applaud the wiſdom of Providence in any part of the conſtitution of nature, we ſhould be very ſure that we do not miſtake concerning the effects of that conſtitution.

A great deal has been written by Gaſſendi, Le Clerc, Muſſchenbroek, and Du Tour, concerning the place to which we refer an object viewed by one or both eyes. But the moſt ſatisfactory account of this matter that we have met with, the reader will find in Dr Well's Eſſay above quoted, which will teach any perſon how to ſatisfy himſelf by experiment with reſpect to viſible poſition and viſible motion.

§ 4. *Of the Appearance of Objects ſeen through Media of different Forms.*

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The various appearances of objects ſeen thro' media of different forms ſtated and inveſtigated.

For the more eaſy apprehenſion of what relates to this ſubject, we ſhall premiſe the five following particulars, which either have been already mentioned, or follow from what has been before laid down.

1. That as each point of an object, when viewed by the naked eye, appears in its proper place, and as that place is always to be found in the line in which the axis of a pencil of rays flowing from it enters the eye, or elſe in the line which Dr Wells calls the common axis; we from hence acquire a habit of judging the point to be ſituated in that line: and, becauſe the mind is unacquainted with what refractions the rays ſuffer before they enter the eye, therefore, in caſes where they are diverted from their natural courſe, by paſſing through any medium, it judges the point to be in that line produced back in which the axis of a pencil of rays flowing from it is ſituated the inſtant they enter the eye, and not in that it was in before refraction. We ſhall therefore, in what follows, ſuppoſe the apparent place of an object, when ſeen through a refracting medium, to be ſomewhere in that line produced back in which the axis of a pencil of rays flowing from it proceeds after they have paſſed through the medium.

2. That we are able to judge, though imperfectly, of the diſtance of an object by the degree of divergency, wherein the rays flowing from the ſame point of the object enter the pupil of the eye, in caſes where that divergency is conſiderable; but becauſe in what follows it will be neceſſary to ſuppoſe an object, when ſeen through a medium whereby its apparent diſtance is altered, to appear in ſome determinate ſituation, in thoſe caſes where the divergency of the rays at their entrance into the eye is conſiderable, we will ſuppoſe the object to appear where thoſe lines which they deſcribe in entering, if produced back, would croſs each other: though it muſt not be aſſerted, that this is the preciſe diſtance; becauſe the brightneſs, diſtinctneſs, and apparent magnitude of the object, on which its apparent diſtance in ſome meaſure depends, will alſo ſuffer an alteration by the refraction of the rays in paſſing through that medium.

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3. That we eſtimate the magnitude of an object by that of the optic angle.

4. That viſion is the brighter, the greater the number of rays is which enter the pupil. And,

5. That, in ſome caſes, the apparent brightneſs, diſtinctneſs, and magnitude of an object, are the only means whereby our judgment is determined in eſtimating the diſtance of it.

Prop. I. An object placed within a medium terminated by a plane ſurface on that ſide which is next the eye, if the medium be denſer than that in which the eye is (as we ſhall always ſuppoſe it to be, unleſs where the contrary is expreſſed), appears nearer to the ſurface of the medium than it is.

Plate CCCLVIII.

Thus, if A be a point of an object placed within the medium BDCE (fig. 5.), and A*b* A*c* be two rays proceeding from thence, theſe rays paſſing out of a denſer into a rarer medium, will be refracted from their reſpective perpendiculars *bd*, *ce*, and will enter the eye at H, ſuppoſe in the directions *bf*, *cg*: let then theſe lines be produced back till they meet in F; this will be the apparent place of the point A; and becauſe the refracted rays *bf*, *cg* will diverge more than the incident ones A*b*, A*c*, it will be nearer to the points *b* and *c* than the point A; and as the ſame is true of each point in the object, the whole will appear to an eye at H, nearer to the ſurface BC than it is.

From hence it is, that when one end of a ſtraight ſtick is put under water, and the ſtick is held in an oblique poſition, it appears bent at the ſurface of the water; viz. becauſe each point that is under water appears nearer the ſurface, and conſequently higher than it is.

From hence likewiſe it is, that an object at the bottom of a veſſel may be ſeen when the veſſel is filled with water, though it be ſo placed with reſpect to the eye, that it cannot be ſeen when the veſſel is empty. To explain this, let ABCD (fig. 6.) repreſent a veſſel, and let E be an object lying at the bottom of it. This object, when the veſſel is empty, will not be ſeen by an eye at F, becauſe HB, the upper part of the veſſel, will obſtruct the ray EH; but when it is filled with water to the height GI, the ray at EK being refracted at the ſurface of the water into the line KF, the eye at F ſhall ſee the object by means of that.

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An object ſituated in the horizon appears above its true place.

In like manner, an object ſituated in the horizon appears above its true place, upon account of the refraction of the rays which proceed from it in their paſſage through the atmoſphere of the earth. For, firſt, If the object be ſituated beyond the limits of the atmoſphere, its rays in entering it will be refracted towards

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the perpendicular; that is, towards a line drawn from the point where they enter, to the centre of the earth, which is the centre of the atmoſphere: and as they paſs on, they will be continually refracted the ſame way, becauſe they are all along entering a denſer part, the centre of whoſe convexity is ſtill the ſame point; upon which account the line they deſcribe will be a curve bending downwards: and therefore none of the rays that come from that object can enter an eye upon the ſurface of the earth, except what enter the atmoſphere higher than they need to do if they could come in a right line from the object: conſequently the object muſt appear above its proper place. Secondly, If the object be placed within the atmoſphere, the caſe is ſtill the ſame; for the rays which flow from it muſt continually enter a denſer medium whoſe centre is below the eye; and therefore being refracted towards the centre, that is, downwards as before, thoſe which enter the eye muſt neceſſarily proceed as from ſome point above the object; wherefore the object will appear above its proper place.

From hence it is, that the ſun, moon, and ſtars, appear above the horizon, when they are juſt below it; and higher than they ought to do, when they are above it: Likewiſe diſtant hills, trees, &c. ſeem to be higher than they are.

Further, The lower theſe objects are in the horizon, the greater is the obliquity with which the rays which flow from them enter the atmoſphere, or paſs from the rarer into the denſer parts of it; and therefore they appear to be the more elevated by refraction: upon which account the lower parts of them are apparently more elevated than the other. This makes their upper and under parts ſeem nearer than they are; as is evident from the ſun and moon, which appear of an oval form when they are in the horizon, their horizontal diameters appearing of the ſame length they would do if the rays ſuffered no refraction, while their vertical ones are ſhortened thereby.

Prop. II. An object ſeen through a medium terminated by plane and parallel ſurfaces, appears nearer, brighter, and larger, than with the naked eye.

Plate CCLVIII.

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An object ſeen thro' a plane medium appears nearer and brighter than ſeen by the naked eye.

For inſtance, let AB (fig. 7.) be the object, CDEF the medium, and GH the pupil of an eye, which is here drawn large to prevent confuſion in the figure.— And, 1ſt, let RK, RL, be two rays proceeding from the point R, and entering the denſer medium at K and L; theſe rays will here by refraction be made to diverge leſs, and to proceed afterwards, ſuppoſe in the lines K*a*, L*b*; at *a* and *b*, where they paſs out of the denſer medium, they will be as much refracted the contrary way, proceeding in the lines *ac*, *bd*, parallel to their firſt directions. Produce theſe lines back till they meet in *e*; this will be the apparent place of the point R; and it is evident from the figure, that it muſt be nearer the eye than that point; and becauſe the ſame is true of all other pencils flowing from the object AB, the whole will be ſeen in the ſituation *fg*, nearer to the eye than the line AB. 2d, As the rays RK, RL, would not have entered the eye, but have paſſed by it in the directions K*r*, L*t*, had they not been refracted in paſſing through the medium, the object appears brighter. 3d, The rays A*h*, B*i*, will be refracted at *h* and *i* into the leſs converging lines *hk*, *il*, and at the other ſurface into *k*M, *l*M, parallel to A*h* and B*i* produced; ſo that the extremities of the object will appear in the lines M*k*, M*l* produced, viz. in *f* and *g*, and under as large an angle *f*M*g*, as the angle A*q*B under which an eye at *q* would have ſeen it had there been no medium interpoſed to refract the rays; and therefore it appears larger to the eye at GH, being ſeen through the interpoſed medium, than otherwiſe it would have done. But it is here to be obſerved, that the nearer the point *e* appears to the eye on account of the refraction of the rays RK, RL, the ſhorter is the image *fg*, becauſe it is terminated by the lines M*f* and M*g*, upon which account the object is made to appear leſs; and therefore the apparent magnitude of an object is not much augmented by being ſeen through a medium of this form.

Farther, It is apparent from the figure, that the effect of a medium of this form depends wholly upon its thickneſs; for the diſtance between the lines R*r* and *ec*, and conſequently the diſtance between the points *e* and R, depends upon the length of the line K*a*:— Again, The diſtance between the lines AM and *f*M depends on the length of the line *hk*; but both K*a* and *hk* depend on the diſtance between the ſurfaces CE and DF, and therefore the effect of this medium depends upon its thickneſs.

Prop. III. An object ſeen through a convex lens, appears larger, brighter, and more diſtant, than with the naked eye.

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Seen thro' a convex lens appears larger, brighter, and more diſtant.

To illuſtrate this, let AB (fig. 8.) be the object, CD the lens, and EF the eye. 1. From A and B, the extremities of the object, draw the lines AY*r*, BX*r*, croſſing each other in the pupil of the eye; the angle A*r*B comprehended between theſe lines, is the angle under which the object would be ſeen with the naked eye. But by the interpoſition of a lens of this form, whoſe property it is to render converging rays more ſo, the rays AY and BX will be made to croſs each other before they reach the pupil. There the eye at E will not perceive the extremities of the object by means of theſe rays (for they will paſs it without entering), but by ſome others which muſt fall without the points Y and X, or between them; but if they fall between them, they will be made to concur ſooner than they themſelves would have done; and therefore, if the extremities of the object could not be ſeen by them, it will much leſs be ſeen by theſe. It remains therefore, that the rays which will enter the eye from the points A and B after refraction, muſt fall upon the lens without the points Y and X; let then the rays AO and BP be ſuch. Theſe after refraction entering the eye at *r*, the extremities of the object will be ſeen in the lines *r*Q, *r*T, produced, and under the optic angle Q*r*T, which is larger than A*r*B, and therefore the apparent magnitude of the object will be increaſed.— 2. Let GHI be a pencil of rays flowing from the point G; as it is the property of this lens to render diverging rays leſs diverging, parallel, or converging, it is evident that ſome of thoſe rays, which would proceed on to F and E, and miſs the eye were they to ſuffer no refraction in paſſing through the lens, will now enter it; by which means the object will appear brighter. 3. As to the apparent diſtance of the object, that will vary according to the ſituation of it with reſpect to the focus of parallel rays of the lens.

1. Then

Appearance of objects ſeen through Media of different Forms.

1. Then, let us ſuppoſe the object placed ſo much nearer the lens than its focus of parallel rays, that the refracted rays KE and LF, though rendered leſs diverging by paſſing through it, may yet have a conſiderable degree of divergency, ſo that we may be able to form a judgment of the diſtance of the object thereby. In this caſe, the object ought to appear where EK, FL, produced back concur; which, becauſe they diverge leſs than the rays GH, GI, will be beyond G, that is, at a greater diſtance from the lens than the object is. But becauſe both the brightneſs and magnitude of the object will at the ſame time be augmented, prejudice will not permit us to judge it quite ſo far off as the point where thoſe lines meet, but ſomewhere between that point and its proper place. 2. Let the object be placed in the focus of parallel rays, then will the rays KE and LF become parallel; and though in this caſe the object would appear at an immenſe diſtance, if that diſtance were to be judged of by the direction of the rays KE and LF, yet upon account of the brightneſs and magnitude of it, we ſhall not think it much farther from us than if it were ſeen by the naked eye. 3. If the object be ſituated beyond the focus of parallel rays, as in BA (fig. 9.), the rays flowing from thence and falling upon the lens CD, will be collected into their reſpective foci at *a* and *b*, and the intermediate points *m*, *n*, &c. and will there form an image of the object AB; and after croſſing each other in the ſeveral points of it, as expreſſed in the figure, will paſs on diverging as from a real object. Now if an eye be ſituated at *c*, where A*c*, B*c*, rays proceeding from the extreme points of the object, make not a much larger angle A*c*B, than they would do if there were no lens interpoſed, and the rays belonging to the ſame pencil do not converge ſo much as thoſe which the eye would receive if it were placed nearer to *a* or *b*, the object upon theſe accounts appearing very little larger or brighter than with the naked eye, is ſeen nearly in its proper place: but if the eye recedes a little way towards *ab*, the object then appearing both brighter and larger, ſeems to approach the lens: which is an evident proof of what has been ſo often aſſerted, *viz.* that we judge of the diſtance of an object in ſome meaſure by its brightneſs and magnitude; for the rays converge the more the farther the eye recedes from the lens; and therefore if we judged of the diſtance of the object by the direction of the rays which flow from it, we ought in this caſe to conceive it at a greater diſtance, than when the rays were parallel, or diverged at their entrance into the eye.

Plate cccLVIII.

That the object ſhould ſeem to approach the lens in this caſe, was a difficulty that exceedingly puzzled the learned Barrow, and which he pronounces inſuperable, and not to be accounted for by any theory we have of viſion. Molineaux alſo leaves it to the ſolution of others, as that which will be inexplicable, till a more intimate knowledge of the viſive faculty, as he expreſſes it, be obtained by mortals.

They imagined, that ſeeing an object appears farther off, the leſs the rays diverge which fall upon the eye, if they ſhould proceed parallel to each other, it ought to appear exceeding remote; and if they ſhould converge, it ſhould then appear more diſtant ſtill: the reaſon of this was, becauſe they looked upon the apparent place of an object, as owing only to the direction of the rays whatever it was, and not at all to its apparent magnitude or ſplendour.

Appearance of Objects ſeen through Media of different Forms.

Perhaps it may proceed from our judging of the diſtance of an object in ſome meaſure by its magnitude, that that deception of ſight commonly obſerved by travellers may ariſe; *viz.* that upon the firſt appearance of a building larger than uſual, as a cathedral church, or the like, it generally ſeems nearer to them, than they afterwards find it to be.

169
In certain circumſtances an object ſeen through a convex lens appears inverted and pendulous in the air.

Prop. IV. If an object be placed farther from a convex lens than its focus of parallel rays, and the eye be ſituated farther from it on the other ſide than the place where the rays of the ſeveral pencils are collected into their reſpective foci, the object appears inverted, and pendulous in the air, between the eye and the lens.

To explain this, let AB (fig. 9.) repreſent the object, CD the lens; and let the rays of the pencil ACD be collected in *a*, and thoſe of BCD in *b*, forming there an inverted image of the object AB, and let the eye be placed in F: it is apparent from the figure, that ſome of the refracted rays which paſs through each point of the image will enter the eye as from a real object in that place; and therefore the object AB will appear there, as the propoſition aſſerts. But we are ſo little accuſtomed to ſee objects in this manner, that it is very difficult to perceive the image with one eye; but if both eyes are ſituated in ſuch a manner, that rays flowing from each point of the image may enter both, as at G and H, and we direct our optic axes to the image, it is eaſy to be perceived.

If the eye be ſituated in *a* or *b*, or very near them on either ſide, the object appears exceedingly confuſed, *viz.* if at *d*, the rays which proceed from the ſame point of the object converge ſo very much, and if at *e*, they diverge ſo much, that they cannot be collected together upon the retina, but fall upon it as if they were the axes of ſo many diſtinct pencils coming through every point of the lens; wherefore little more than one ſingle point of the object is ſeen at a time, and that appears all over the lens; from whence nothing but confuſion ariſes.

If the lens be ſo large that both eyes may be applied to it, as in *h* and *k*, the object will appear double; for it is evident from the figure, that the rays which enter the eye at *h* from either extremity of the object A or B, do not proceed as from the ſame point with that from whence thoſe which enter the other at *k* ſeem to flow; the mind therefore is here deceived, and looks upon the object as ſituated in two different places, and therefore judges it to be double.

170
An object through a concave lens is ſeen nearer, ſmaller, and leſs bright than with the naked eye.

Prop. V. An object ſeen through a concave lens appears nearer, ſmaller, and leſs bright, than with the naked eye.

Thus, let AB (fig. 10.) be the object, CD the pupil of an eye, and EF the lens. Now, as it is the property of a lens of this form to render diverging rays more ſo, and converging ones leſs ſo, the diverging rays GH, GI, proceeding from the point G, will be made to diverge more, and ſo to enter the eye as from ſome nearer point *g*; and the rays AH, BI, which converge, will be made to converge leſs, and to enter the eye as from the points *a* and *b*; wherefore the objects will appear in the ſituation *a g b*, leſs and nearer than without the lens. Further, As the rays which proceed from G are rendered more diverging, ſome of them will be made to paſs by the pupil of the eye, which otherwiſe would have entered it, and therefore each point of the object will appear leſs bright.

Prop. VI. An object ſeen through a polygonous glaſs, that is, ſuch as is terminated by ſeveral plain ſurfaces, is multiplied thereby.

Plate CCCLVIII.

For inſtance, let A (fig. 11.) be an object, and BC a polygonous glaſs terminated by the plane ſurfaces BD, DE, &c. and let the ſituation of the eye F be ſuch, that the rays AB being refracted in paſſing through the glaſs, may enter it in the direction BF, and the rays AC in the direction CF. Then will the eye, by means of the former, ſee the object in G, and by the latter in H; and by means of the rays AI, the object will appear alſo in its proper ſituation A.

Sect. III. *Of the Reflection of Light.*

171 Some portion of light always reflected from tranſparent bodies.

When a ray of light falls upon any body, however tranſparent, the whole of it never paſſes through the body, but ſome part is always driven back or reflected from it; and it is by this reflected light that all bodies which have no light of their own become viſible to us. Of that part of the ray which enters, another part is alſo reflected from the ſecond ſurface, or that which is fartheſt from the luminous body. When this part arrives again at the firſt ſurface, part of it is reflected back from that ſurface; and thus it continues to be reflected between the two ſurfaces, and to paſs backwards and forwards within the ſubſtance of the medium, till ſome part is totally extinguiſhed and loſt. Beſides this inconſiderable quantity, however, which is loſt in this manner, the ſecond ſurface often reflects much more than the firſt; inſomuch that, in certain poſitions, ſcarce any rays will paſs through both ſides of the medium. A very conſiderable quantity is alſo unaccountably loſt or extinguiſhed at each reflecting ſurface; inſomuch that no body, however tranſparent, can tranſmit all the rays which fall upon it; neither, though it be ever ſo well fitted for reflection, will it reflect them all.

§ 1. *Of the Cauſe of Reflection.*

The reflection of light is by no means ſo eaſily accounted for as the refraction of the ſame fluid. This property, as we have ſeen in the laſt ſection, may be accounted for in a ſatisfactory manner by the ſuppoſition of an attractive power diffuſed throughout the medium, and extending a very little way beyond it; but with regard to the reflection of light, there ſeems to be no ſatisfactory hypotheſis hitherto invented. Of the principal opinions on this ſubject Mr Rowning hath given us the following account.

172 Light is not reflected by impinging on the ſolid parts of bodies at the firſt ſurface,

I. It was the opinion of philoſophers, before Sir Iſaac Newton diſcovered the contrary, that light is reflected by impinging upon the ſolid parts of bodies. But that it is not ſo, is clear for the following reaſons.

And, firſt, It is not reflected at the firſt ſurface of a body by impinging againſt it.

For it is evident, that, in order to the due and regular reflection of light, that is, that the reflected rays ſhould not be diſperſed and ſcattered one from another, there ought to be no raſures or unevenneſs in the reflecting ſurface large enough to bear a ſenſible proportion to the magnitude of a ray of light; becauſe if the ſurface abounds with ſuch, the reflected rays will rather be ſcattered like a parcel of pebbles thrown upon a rough pavement, than reflected with that regularity with which light is obſerved to be from a well poliſhed ſurface. Now thoſe ſurfaces, which to our ſenſes appear perfectly ſmooth and well poliſhed, are far from being ſo; for to poliſh, is no other than to grind off the larger eminences and protuberances of the metal with the rough and ſharp particles of ſand, emery, or putty, which muſt of neceſſity leave behind them an infinity of raſures and ſcratches, which, though inconſiderable with regard to the former roughneſſes, and too minute to be diſcerned by us, muſt nevertheleſs bear a large proportion to, if not vaſtly exceed, the magnitude of the particles of light.

173 nor at the ſecond.

Secondly, It is not reflected at the ſecond ſurface by impinging againſt any ſolid particles.

That it is not reflected by impinging upon the ſolid particles which conſtitute this ſecond ſurface, is ſufficiently clear from the foregoing argument; the ſecond ſurfaces of bodies being as incapable of a perfect poliſh as the firſt: and it is farther confirmed from hence, viz. that the quantity of light reflected differs according to the different denſity of the medium behind the body. And that it is not reflected by impinging upon the particles which conſtitute the ſurface of the medium behind it, is evident, becauſe the ſtrongeſt reflection of all at the ſecond ſurface of a body, is when there is a vacuum behind it. This therefore wants no farther proof.

174 Suppoſition of a repulſive force;

II. It has been thought by ſome, that it is reflected at the firſt ſurface of a body, by a repulſive force equally diffuſed over it: and at the ſecond, by an attractive force.

175 objected to.

1. If there be a repulſive force diffuſed over the ſurface of bodies that repels rays of light at all times, then, ſince by increaſing the obliquity of a ray we diminiſh its perpendicular force (which is that only whereby it muſt make its way through this repulſive force), however weakly that force may be ſuppoſed to act, rays of light may be made to fall with ſo great a degree of obliquity on the reflecting ſurface, that there ſhall be a total reflection of them there, and not one particle of light be able to make its way through: which is contrary to obſervation; the reflection of light at the firſt ſurface of a tranſparent body being never total in any obliquity whatever. The hypotheſis therefore in this particular muſt be falſe.

176 Attractive force ſuppoſed;

2. As to the reflection at the ſecond ſurface by the attractive force of the body; this may be conſidered in two reſpects: firſt, when the reflection is total; ſecondly, when it is partial.

And, firſt, In caſes where the reflection is total, the cauſe of it is undoubtedly that ſame attractive force by which light would be refracted in paſſing out of the ſame body. This is manifeſt from that analogy which is obſervable between the reflection of light at this ſecond ſurface, and its refraction there. For, otherwiſe, what can be the reaſon that the total reflection ſhould begin juſt when the obliquity of the incident ray, at its arrival at the ſecond ſurface, is ſuch, that the refracted angle ought to be a right one; or when the ray, were it not to return in reflection, ought to paſs on parallel to the ſurface, without going from it? For in this caſe it is evident, that it ought to be returned by this very power, and in ſuch manner that the angle of reflection ſhall be equal to the angle of incidence; juſt as a ſtone thrown obliquely from the earth, after it is ſo far turned out of its courſe by the attraction of the earth, as to begin to move horizontally, or parallel to the ſurface of the earth, is then by the ſame power made to return in a curve ſimilar to that which is deſcribed in its departure from the earth, and ſo falls with the ſame degree of obliquity that it was thrown with.

178 Objected to. But, ſecondly, As to the reflection at the ſecond ſurface, when it is partial; an attractive force uniformly ſpread over it, as the maintainers of this hypotheſis conceive it to be, can never be the cauſe thereof. Becauſe it is inconceivable, that the ſame force, acting in the ſame circumſtances in every reſpect, can ſometimes reflect the violet-coloured rays, and tranſmit the red, and at other times reflect the red and tranſmit the violet.'

We have ſtated this objection, becauſe it is our buſineſs to conceal no plauſible opinions: but it is not valid; for in each colour, the reflection takes place at that angle, and no other, where the refraction of *that* ray would make it parallel to the poſterior ſurface.

This partial reflection and refraction is a great difficulty in all the attempts which have been made to give a mechanical explanation of the phenomena of optics. It is equally a deſideratum in that explanation which was propoſed by Huygens, and, ſince his time, revived by Euler, by means of the undulations of an elaſtic fluid, although a vague conſideration of undulatory motions ſeems to offer a very ſpecious analogy. But a *rigid* application of ſuch *knowledge* as we have acquired of ſuch motions, will convince any unprejudiced mathematician, that the phenomena of undulation are eſſentially diſſimilar to the phenomena of light. The inflection of light, and its refraction, equally demonſtrate that light *is acted on* by moving forces in a direction perpendicular to the ſurface; and it is equally demonſtrable that ſuch forces muſt, in proper circumſtances, produce reflections preciſely ſuch as we obſerve. The only difficulty is to ſhow how there can be forces which produce both reflection and refraction, in circumſtances which are ſimilar. The fact is, that ſuch effects are produced: the firſt logical inference is, that with reſpect to the light which is reflected and that which is refracted, the circumſtances are *not* ſimilar; and our attention ſhould be directed to the diſcovery of that diſſimilarity. All the phenomena of combined reflection and refraction ſhould be examined and claſſed according to their generality, not doubting but that theſe points of reſemblance will lead to the diſcovery of their cauſes. Now the experiments of M. Bouguer ſhow that bodies differ extremely in their powers of thus ſeparating light by reflection and refraction, ſome of them reflecting much more at a given angle than others. It is not therefore *a general property of light* to be partly reflected and partly refracted, but a *diſtinctive* property of *different* bodies; and ſince we ſee that they poſſeſs it in *different* degrees, we are authorized to conclude that ſome bodies *may want it altogether*. We may therefore expect ſome ſucceſs by conſidering how bodies are affected by light, as well as how light is affected by bodies. Now, in all the phenomena of the material world we find bodies connected by mutual forces. We know no caſe where a body A tends towards a body B, or, in common language, is attracted by it, without, at the ſame time, the body B tending towards A. This is obſerved in the phenomena of magnetiſm, electricity, gravitation, corpuſcular attraction, impulſe, &c. We ſhould therefore conclude from analogy, that as bodies change the motion of light, light alſo changes the motion of bodies; and that the particles near the ſurface are put into vibration by the paſſage of light through among them.

178 The objection obviated. Suppoſe a parcel of cork balls all hanging as pendulums in a ſymmetrical order, and that an electrified ball paſſes through the midſt of them; it is very eaſy to ſhow that it may proceed through this aſſemblage in various directions with a ſinuated motion, and without touching any of them, and that its ultimate direction will have a certain inclination to its primary direction, depending on the outline of the aſſemblage, juſt as is obſerved in the motion of light; and, in the mean time, the cork balls will be variouſly agitated. Juſt ſo muſt it happen to the particles of a tranſparent body, if we ſuppoſe that they act on the particles of light by mutual attractions and repulſions.

An attentive conſideration of what happens here will ſhow us that the ſuperficial particles will be much more agitated than the reſt; and thus a ſtratum be produced, which, in any inſtant, will act on thoſe particles of light which are then approaching them in a manner different from that in which they will act on ſimilarly ſituated particles of light, which come into the place of the firſt in the following moment, when theſe acting particles of the body have (by their motion of vibration) changed their own ſituation. Now it is clearly underſtood, that, in all motions of vibration, ſuch as the motions of pendulums, there is a moment when the body is in its natural ſituation, as when the pendulum is in the vertical line. This *may* happen in the ſame inſtant in each atom of the tranſparent body. The particles of light which *then* come within the ſphere of action may be wholly reflected; in the next moment, particles of light in the very ſituation of the firſt may be refracted.

Then will ariſe a ſeparation of light; and as this will depend on the manner in which the particles of bodies are agitated by it during its paſſage, and as this again will depend on the nature of the body, that is, on the law of action of thoſe forces which connect the particles with each other, and with the particles of light, it will be different in different bodies. But in all bodies there will be this general reſemblance, that the ſeparation will be moſt copious in great obliquities of incidence, which gives the repulſive forces more time for action, while it diminiſhes the perpendicular force of the light. Such a reſemblance between the phenomena and the legitimate conſequences of the aſſumption (the agitation of the parts of the body), gives us ſome authority for aſſigning this as the cauſe; nor can the aſſumption

OPTICS.

Plate CCCLVIII.

Fig. 1.

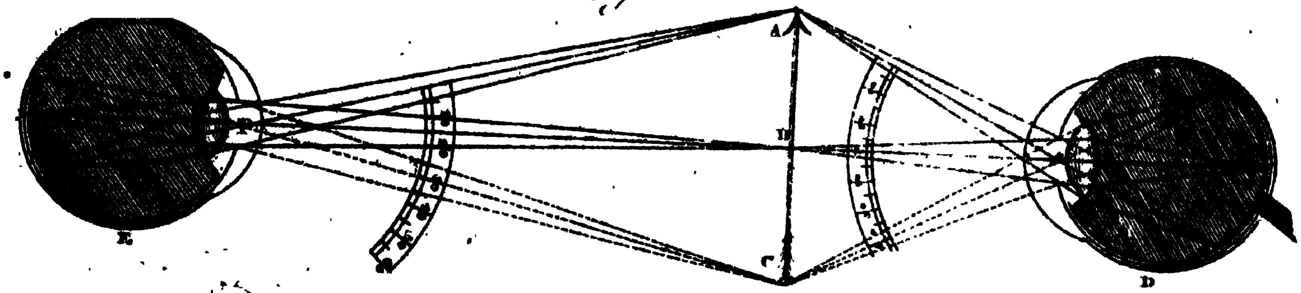
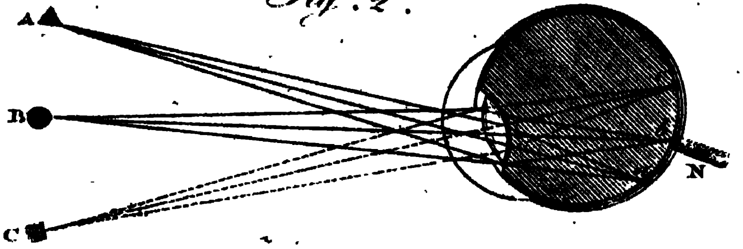


Fig. 2.



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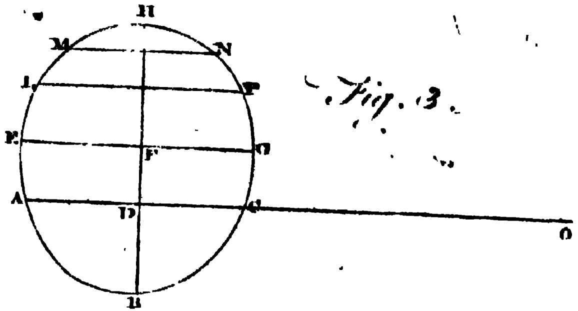

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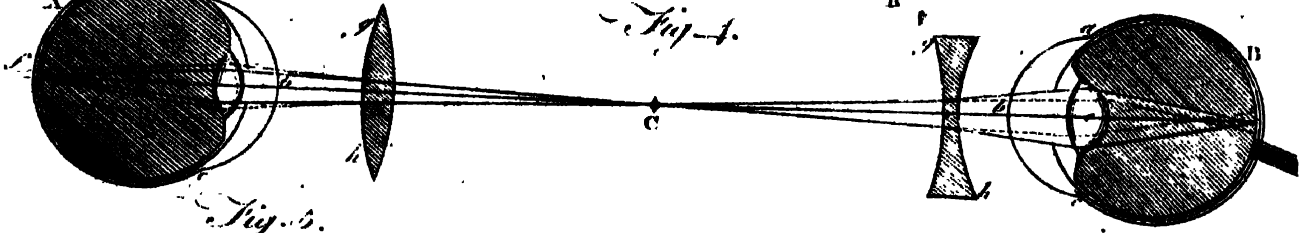

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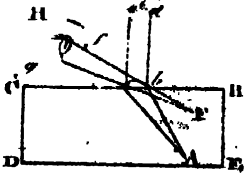


Fig. 6.

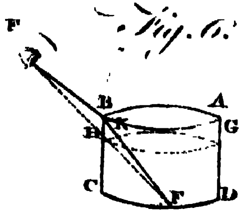


Fig. 7.

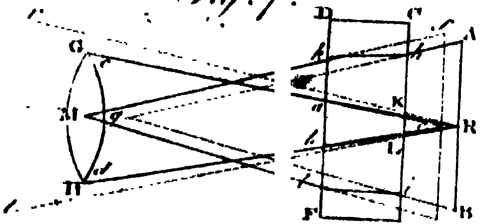


Fig. 9.

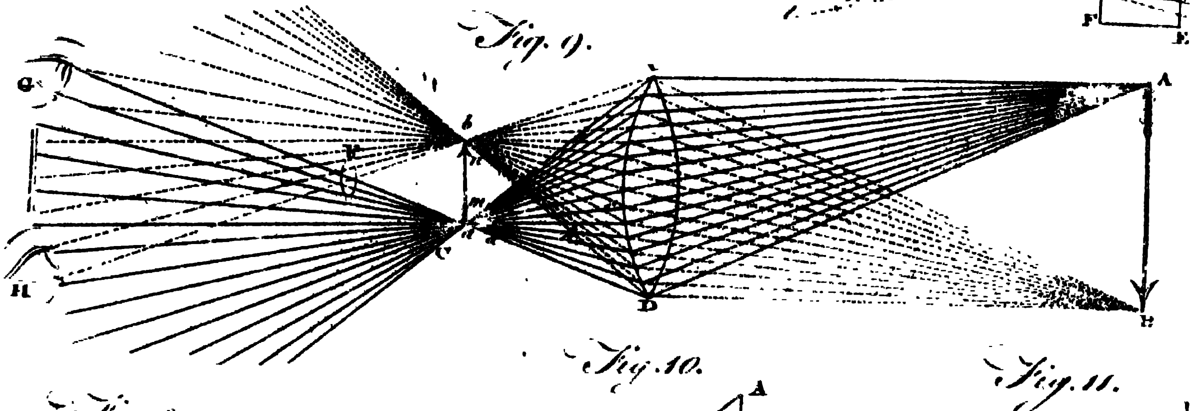


Fig. 8.

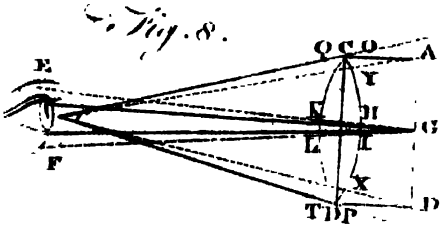


Fig. 10.

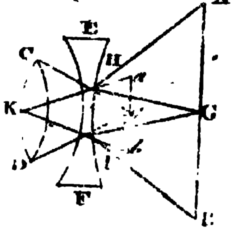
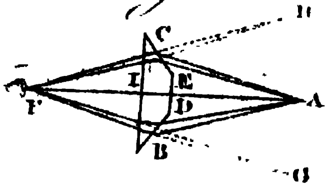


Fig. 11.



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tion be called *gratuitous*. To ſuppoſe that the particles of the tranſparent body *are not thus agitated*, would be a moſt gratuitous contradiction of a law of nature to which we know no other exception.

Thus the objection raiſed in N° 132. is obviated, becauſe the reflection and refraction are not here conceived as ſimultaneous, but as ſucceſſive.

179 Another Hypotheſis.

III. Some, being apprehenſive of the inſufficiency of a repulſive and attractive force diffuſed over the ſurfaces of bodies and acting uniformly, have ſuppoſed, that, by the action of light upon the ſurface of bodies, the matter of theſe bodies is put into an undulatory motion; and that where the ſurface of it is ſubſiding light is tranſmitted, and in thoſe places where it is riſing light is reflected. But to overlook the objections which we have juſt made to this theory of undulation, we have only to obſerve, that, were it admitted, it ſeems not to advance us one jot farther; for in thoſe caſes, ſuppoſe where red is reflected and violet tranſmitted, how comes it to paſs that the red impinges only on thoſe parts when the waves are riſing, and the violet when they are ſubſiding?

180 Sir I. Newton's Hypotheſis;

IV. The next hypotheſis that we ſhall take notice of, is that remarkable one of Sir Iſaac Newton's fits of eaſy reflection and tranſmiſſion, which we ſhall now explain and examine.

That author, as far as we can apprehend his meaning in this particular, is of opinion, that light in its paſſage from the luminous body, is diſpoſed to be alternately reflected by and tranſmitted through any refracting ſurface it may meet with; that theſe diſpoſitions (which he calls *fits of eaſy reflection and eaſy tranſmiſſion*) return ſucceſſively at equal intervals; and that they are communicated to it at its firſt emiſſion out of the luminous body it proceeds from, probably by ſome very ſubtile and elaſtic ſubſtance diffuſed through the univerſe, and that in the following manner. As bodies falling into water, or paſſing through the air, cauſe undulations in each, ſo the rays of light may excite vibrations in this elaſtic ſubſtance. The quickneſs of which vibrations depending on the elaſticity of the medium (as the quickneſs of the vibrations in the air, which propagate ſound, depend ſolely on the elaſticity of the air, and not upon the quickneſs of thoſe in the ſounding body), the motion of the particles of it may be quicker than that of the rays: and therefore, when a ray at the inſtant it impinges upon any ſurface, is in that part of a vibration of this elaſtic ſubſtance which conſpires with its motion, it may be eaſily tranſmitted; and when it is in that part of a vibration which is contrary to its motion, it may be reflected. He further ſuppoſes, that when light falls upon the ſurface of a body, if it be not in a fit of eaſy tranſmiſſion, every ray is there put into one, ſo that when they come at the other ſide (for this elaſtic ſubſtance, eaſily pervading the pores of bodies, is capable of the ſame vibrations within the body as without it), the rays of one colour ſhall be in a fit of eaſy tranſmiſſion, and thoſe of another in a fit of eaſy reflection, according to the thickneſs of the body, the intervals of the fits being different in rays of a different kind. This ſeems to account for the different colours of the bubble and thin plate of air and water, as is obvious enough; and likewiſe for the reflection of light at the ſecond ſurface of a thicker body; for the light reflected from thence is alſo obſerved to be coloured, and to form rings according to the different thickneſs of the body, when not intermixed and confounded with other light, as will appear from the following experiment. If a piece of glaſs be ground concave on one ſide and convex on the other, both its concavity and convexity having one common centre; and if a ray of light be made to paſs through a ſmall hole in a piece of paper held in that common centre, and be permitted to fall on the glaſs; beſides thoſe rays which are regularly reflected back to the hole again, there will be others reflected to the paper, and form coloured rings ſurrounding the hole, not unlike thoſe occaſioned by the reflection of light from thin plates.

181 Untenable.

It is ever with extreme reluctance that we venture to call in queſtion the doctrines of Newton; but to his theory of reflection there is this inſuperable objection, that it explains nothing, unleſs the *cauſe* of the fits of more eaſy reflection and tranſmiſſion be held as legitimate, namely, that *they are produced by the undulations of another elaſtic fluid, incomparably more ſubtile than light*, acting upon it in the way of impulſe. The fits themſelves are *matters of fact*, and no way different from what we have endeavoured to account for: but to admit this theory of them would be to tranſgreſs every rule of philoſophizing, as we have ſhown them to be ſuſceptible of explanation from acknowledged optical laws.

§ 2. *Of the Laws of Reflection.*

182 The fundamental law of Reflection.

The fundamental law of the reflection of light, is, that in all caſes the angle of reflection is equal to the angle of incidence. This is found by experiment to be the caſe, and beſides may be demonſtrated mathematically from the laws of percuſſion in bodies perfectly elaſtic. The axiom therefore holds good in every caſe of reflection, whether it be from plane ſurfaces or ſpherical ones, and that whether they are convex or concave; and hence the ſeven following propoſitions relating to the reflection of light from plane and ſpherical ſurfaces may be deduced.

I. Rays of light reflected from a plane ſurface have the ſame degree of inclination to one another that their reſpective incident ones have.—For the angle of reflection of each ray being equal to that of its reſpective incident one, it is evident, that each reflected ray will have the ſame degree of inclination to that portion of the ſurface from whence it is reflected that its incident one has; but it is here ſuppoſed, that all thoſe portions of ſurface from whence the rays are reflected, are ſituated in the ſame plane; conſequently the reflected rays will have the ſame degree of inclination to each other that their incident ones have, from whatever part of the ſurface they are reflected.

Plate CCCLIX.

183 Laws of reflection from a concave ſurface.

II. Parallel rays reflected from a concave ſurface are rendered converging.—To illuſtrate this, let AF, CD, EB, (fig. 1.) repreſent three parallel rays falling upon the concave ſurface FB, whoſe centre is C. To the points F and B draw the lines CF, CB; theſe being drawn from the centre, will be perpendicular to the ſurface at thoſe points. The incident ray CD alſo paſſing through the centre, will be perpendicular to the ſurface, and therefore will return after reflection in the ſame line; but the oblique rays AF and EB will be reflected into the lines FM and BM, ſituated on the contrary ſide of their reſpective perpendiculars CF and CB. They will therefore proceed converging after reflection towards ſome point, as M, in the line CD.

III. Converging rays falling on the like ſurface, are made to converge more.—For, every thing remaining as above, let GF, HB, be the incident rays. Now, becauſe theſe rays have larger angles of incidence than the parallel ones AF and EB in the foregoing caſe, their angles of reflection will alſo be larger than thoſe of the others; they will therefore converge after reflection, ſuppoſe in the lines FN and BN, having their point of concourſe N farther from the point C than M, that to which the parallel rays AF and EB converged to in the foregoing caſe; and their preciſe degree of convergency will be greater than that wherein they converged before reflection.

IV. Diverging rays falling upon the like ſurface, are, after reflection, parallel, diverging, or converging. If they diverge from the focus of parallel rays, they then become parallel; if from a point nearer to the ſurface than that, they will diverge, but in a leſs degree than before reflection; if from a point between that and the centre, they will converge after reflection, and that to ſome point on the contrary ſide of the centre, but ſituated farther from it than the point from which they diverged. If the incident rays diverge from a point beyond the centre, the reflected ones will converge to one on the other ſide of it, but nearer to it than the point they diverged from; and if they diverge from the centre, they will be reflected thither again.

1. Let them diverge in the lines MF, MB, proceeding from M, the focus of parallel rays; then, as the parallel rays AF and EB were reflected into the lines FM and BM (by Prop. II.), theſe rays will now on the contrary be reflected into them.

2. Let them diverge from N, a point nearer to the ſurface than the focus of parallel rays, they will then be reflected into the diverging lines FG and BH which the incident rays GF and HB deſcribed that were ſhown to be reflected into them in the foregoing propoſition; but the degree wherein they diverge will be leſs than that wherein they diverged before reflection.

3. Let them proceed diverging from X, a point between the focus of parallel rays and the centre; they then make leſs angles of incidence than the rays MF and MB, which became parallel by reflection: they will conſequently have leſs angles of reflection, and proceed therefore converging towards ſome point, as Y; which point will always fall on the contrary ſide of the centre, becauſe a reflected ray always falls on the contrary ſide of the perpendicular with reſpect to that on which its incident one falls; and of conſequence it will be farther diſtant from the centre than X.

4. If the incident ones diverge from Y, they will, after reflection, converge to X; thoſe which were the incident rays in the former caſe being the reflected ones in this. And, laſtly,

5. If the incident rays proceed from the centre, they fall in with their reſpective perpendiculars; and for that reaſon are reflected thither again.

Plate CCCLIX. 184

From a convex ſurface.

V. Parallel rays reflected from the convex ſurface are rendered diverging.—For, let AB, GD, EF, (fig. 2.) be three parallel rays falling upon the convex ſurface BF, whoſe centre of convexity is C, and let one of them, viz. GD, be perpendicular to the ſurface. Through B, D, and F, the points of reflection, draw the lines CV, CG, and CT; which, becauſe they paſs through the centre, will be perpendicular to the ſurface at theſe points. The incident ray GD being perpendicular to the ſurface, will return after reflection in the ſame line, but the oblique ones AB and EF in the lines BK and FL, ſituated on the contrary ſide of their reſpective perpendiculars BV and FT. They will therefore diverge, after reflection, as from ſome point M in the line GD produced; and this point will be in the middle between D and C.

VI. Diverging rays reflected from the like ſurface are rendered more diverging. For, every thing remaining as above, let GB, GF, be the incident rays. Theſe having larger angles of incidence than the parallel ones AB and EF in the preceding caſe, their angles of reflection will alſo be larger than theirs: they will therefore diverge after reflection, ſuppoſe in the lines BP and FQ, as from ſome point N, farther from C than the point M; and the degree wherein they will diverge will be greater than that wherein they diverged before reflection.

VII. Converging rays reflected from the like ſurface, are parallel, converging, or diverging. If they tend towards the focus of parallel rays, they then become parallel; if to a point nearer the ſurface than that, they converge, but in a leſs degree than before reflection; if to a point between that and the centre, they will diverge after reflection, as from ſome point on the contrary ſide of the centre, but ſituated farther from it than the point they converged to: if the incident rays converge to a point beyond the centre, the reflected ones will diverge as from one on the contrary ſide of it, but nearer to it than the point to which the incident ones converged; and if the incident rays converge towards the centre, the reflected ones will proceed as from thence.

1. Let them converge in the lines KB and LF, tending towards M, the focus of parallel rays; then, as the parallel rays AB, EF were reflected into the lines BK and FL (by Prop. V), thoſe rays will now on the contrary be reflected into them.

2. Let them converge in the lines PB, QF, tending towards N a point nearer the ſurface than the focus of parallel rays, they will then be reflected into the converging lines BG and FG, in which the rays GB, GF proceeded that were ſhown to be reflected into them by the laſt propoſition: but the degree wherein they will converge will be leſs than that wherein they converged before reflection.

3. Let them converge in the lines RB and SF proceeding towards X, a point between the focus of parallel rays and the centre; their angles of incidence will then be leſs than thoſe of the rays KB and LF, which became parallel after reflection: their angles of reflection will therefore be leſs; on which account they muſt neceſſarily diverge, ſuppoſe in the lines BH and FI, from ſome point, as Y; which point (by Prop. IV.) will fall on the contrary ſide of the

centre with reſpect to X, and will be farther from it than that.

4. If the incident rays tend towards Y, the reflected ones will diverge as from X; thoſe which were the incident ones in one caſe being the reflected ones in the other.

5. Laſtly, If the incident rays converge towards the centre, they fall in with their reſpective perpendiculars; on which account they proceed after reflection as from the centre.

We have already obſerved, that in ſome caſes there is a very great reflection from the ſecond ſurface of a tranſparent body. The degree of inclination neceſſary to cauſe a total reflection of a ray at the ſecond ſurface of a medium, is that which requires that the refracted angle (ſuppoſing the ray to paſs out there) ſhould be equal to or greater than a right one; and conſequently it depends on the refractive power of the medium through which the ray paſſes, and is therefore different in different media. When a ray paſſes through glaſs ſurrounded with air, and is inclined to its ſecond ſurface under an angle of 42 degrees or more, it will be wholly reflected there. For, as 11 is to 17 (the ratio of refraction out of glaſs into air), ſo is the ſine of an angle of 42 degrees to a fourth number that will exceed the ſine of a right angle. From hence it follows, that when a ray of light arrives at the ſecond ſurface of a tranſparent ſubſtance with as great or a greater degree of obliquity than that which is neceſſary to make a total reflection, it will there be all returned back to the firſt: and if it proceeds towards that with as great an obliquity as it did towards the other (which it will do if the ſurfaces of the medium be parallel to each other), it will there be all reflected again, &c. and will therefore never get out, but paſs from ſide to ſide, till it be wholly ſuffocated and loſt within the body.—From hence may ariſe an obvious inquiry, how it comes to paſs, that light falling very obliquely upon a glaſs window from without, ſhould be tranſmitted into the room. In anſwer to this it muſt be conſidered, that however obliquely a ray falls upon the ſurface of any medium whoſe ſides are parallel (as thoſe of the glaſs in a window are), it will ſuffer ſuch a degree of refraction in entering there, that it ſhall fall upon the ſecond with a leſs obliquity than that which is neceſſary to cauſe a total reflection. For inſtance, let the medium be glaſs, as ſuppoſed in the preſent caſe: then, as 17 is to 11 (the ratio of refraction out of air into glaſs), ſo is the ſine of the largeſt angle of incidence with which a ray can fall upon any ſurface to the ſine of a leſs angle than that of total reflection. And therefore, if the ſides of the glaſs be parallel, the obliquity with which a ray falls upon the firſt ſurface, cannot be ſo great, but that it ſhall paſs the ſecond without ſuffering a total reflection there.

When light paſſes out of a denſer into a rarer medium, the nearer the ſecond medium approaches the firſt in denſity (or more properly in its refractive power), the leſs of it will be refracted in paſſing from one to the other; and when their refracting powers are equal, all of it will paſs into the ſecond medium.

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The preceding propoſitions demonſtrated mathematically.

The above propoſitions may be all mathematically demonſtrated in the following manner:

Prop. I. Of the reflection of rays from a plane ſurface.

"When rays fall upon a plane ſurface, if they diverge, the focus of the reflected rays will be at the ſame diſtance behind the ſurface, that the radiant point is before it: if they converge, it will be at the ſame diſtance before the ſurface that the imaginary focus of the incident rays is behind it."

This propoſition admits of two caſes.

Case 1. Of diverging rays.

Plate CCCLIX.

Dem. Let AB, AC, (fig. 3.) be two diverging rays incident on the plane ſurface DE, the one perpendicularly, the other obliquely: the perpendicular one AB will be reflected to A, proceeding as from ſome point in the line AB produced; the oblique one AC will be reflected into ſome line as CF, ſuch that the point G, where the line FG produced interſects the line AB produced alſo, ſhall be at an equal diſtance from the ſurface DE with the radiant A. For the perpendicular CH being drawn, ACH and HCF will be the angles of incidence and reflection; which being equal, their complements ACB and FCE are ſo too: but the angle BCG is equal to FCE, as being vertical to it: therefore in the triangles ABC and GBC the angles at C are equal, the ſide BC is common, and the angles at B are alſo equal to each other, as being right ones; therefore the lines AB and BG, which reſpect the equal angles at C, are alſo equal; and conſequently the point G, the focus of the incident rays AB, AC, is at the ſame diſtance behind the ſurface, that the point A is before it. *Q. E. D.*

Case 2. Of converging rays.

This is the converſe of the former caſe. For ſuppoſing FC and AB to be two converging incident rays, CA and BA will be the reflected ones (the angles of incidence in the former caſe being now the angles of reflection, and *vice verſa*), having the point A for their focus; but this, from what was demonſtrated above, is at an equal diſtance from the reflecting ſurface with the point G, which in this caſe is the imaginary focus of the incident rays FC and AB.

Obs. It is not here, as in the refraction of rays in paſſing through a plane ſurface, where ſome of the refracted rays proceed as from one point, and ſome as from another: but they all proceed after reflection as from one and the ſame point, however obliquely they may fall upon the ſurface; for what is here demonſtrated of the ray AC holds equally of any other, as AI, AK, &c.

The caſe of parallel rays incident on a plane ſurface is included in this propoſition: for in that caſe we are to ſuppoſe the radiant to be at an infinite diſtance from the ſurface, and then by the propoſition the focus of the reflected rays will be ſo too; that is, the rays will be parallel after reflection, as they were before.

Prop. II. Of the reflection of parallel rays from a ſpherical ſurface.

"When parallel rays are incident upon a ſpherical ſurface, the focus of the reflected rays will be the middle point between the centre of convexity and the ſurface."

This propoſition admits of two caſes.

Case 1. Of parallel rays falling upon a convex ſurface.

Dem. Let AB, DH, (fig. 4.) repreſent two parallel rays incident on the convex ſurface BH, the one perpendicularly, the other obliquely; and let C be the centre of convexity; ſuppoſe HE to be the reflected ray of the oblique incident one DH proceeding as from F, a point in the line AB produced. Through the point H draw the line CI, which will be perpendicular to the ſurface at that point; and the angles DHI and IHE, being the angles of incidence and reflection, will be equal. To the former of theſe, the angle HCF is equal, the lines AC and DH being parallel; and to the latter the angle CHF, as being vertical; wherefore the triangle CFH is iſoſceles, and conſequently the ſides CF and FH are equal: but ſuppoſing BH to vaniſh, FH is equal to FB; and therefore upon this ſuppoſition FC and FB are equal, that is, the focus of the reflected rays is the middle point between the centre of convexity and the ſurface. *Q. E. D.*

Case 2. Of parallel rays falling upon a concave ſurface.

Plate CCCLIX.

Dem. Let AB, DH, (fig. 5.) be two parallel rays incident, the one perpendicularly, the other obliquely, on the concave ſurface BH, whoſe centre of concavity is C. Let BF and HF be the reflected rays meeting each other in F; this will be the middle point between B and C. For drawing through C the perpendicular CH, the angles DHC and FHC, being the angles of incidence and reflection, will be equal, to the former of which the angle HCF is equal, as alternate; and therefore the triangle CFH is iſoſceles. Wherefore CF and FH are equal: but if we ſuppoſe BH to vaniſh, FB and FH are alſo equal, and therefore CF is equal to FB; that is, the focal diſtance of the reflected rays is the middle point between the centre and the ſurface. *Q. E. D.*

Obs. It is here obſervable, that the farther the line DH, either in fig. 4. or 5. is taken from AB, the nearer the point F falls to the ſurface. For the farther the point H recedes from B, the larger the triangle CFH will become; and conſequently, ſince it is always an iſoſceles one, and the baſe CH, being the radius, is everywhere of the ſame length, the equal legs CF and FH will lengthen; but CF cannot grow longer unleſs the point F approach towards the ſurface. And the farther H is removed from B, the faſter F approaches to it.

This is the reaſon, that whenever parallel rays are conſidered as reflected from a ſpherical ſurface, the diſtance of the oblique one from the perpendicular one is taken ſo ſmall with reſpect to the focal diſtance of that ſurface, that without any phyſical error it may be ſuppoſed to vaniſh.

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Reflected rays from a ſpherical ſurface never proceed from the ſame point.

From hence it follows, that if a number of parallel rays, as AB, CD, EG, &c. fall upon a convex ſurface, (as fig. 6.) and if BA, DK, the reflected rays of the incident ones AB, CD, proceed as from the point F, thoſe of the incident ones CD, EG, viz. DK, GL, will proceed as from N, thoſe of the incident ones EG, HI, as from O, &c. becauſe the farther the incident ones CD, EG, &c. are from AB, the nearer to the ſurface are the points F, *f*, *f*, in the line BF, from which they proceed after reflection; ſo that properly the foci of the reflected rays BA, DK, GL, &c. are not in the line AB produced, but in a curve line paſſing through the points F, N, O, &c.

The ſame is applicable to the caſe of parallel rays reflected from a concave ſurface, as expreſſed by the pricked lines on the other half of the figure, where PQ, RS, TV, are the incident rays; QF, S*f*, V*f*, the reflected ones, interſecting each other in the points X, Y, and F; ſo that the foci of thoſe rays are not in the line FB, but in a curve paſſing through thoſe points.

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Rays proceeding from one point, and falling on a parabolic concave ſurface, are all reflected from one point.

Had the ſurface BH in fig. 4. or 5. been formed by the revolution of a parabola about its axis having its focus in the point F, all the rays reflected from the convex ſurface would have proceeded as from the point F, and thoſe reflected from the concave would have fallen upon it, however diſtant their incident ones AB, DH, might have been from each other. For in the parabola, all lines drawn parallel to the axis make angles with the tangents to the points where they cut the parabola (that is, with the ſurface of the parabola) equal to thoſe which are made with the ſame tangents by lines drawn from thence to the focus; therefore, if the incident rays deſcribe thoſe parallel lines, the reflected ones will neceſſarily deſcribe theſe other, and ſo will all proceed as from, or meet in, the ſame point.

Prop. III. Of the reflection of diverging and converging rays from a ſpherical ſurface.

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Proportional diſtance of the focus of rays reflected from a ſpherical ſurface.

"When rays fall upon any ſpherical ſurface, if they diverge, the diſtance of the focus of the reflected rays from the ſurface is to the diſtance of the radiant point from the ſame (or, if they converge, to that of the imaginary focus of the incident rays), as the diſtance of the focus of the reflected rays from the centre is to the diſtance of the radiant point (or imaginary focus of the incident rays) from the ſame."

This propoſition admits of ten caſes.

Case 1. Of diverging rays falling upon a convex ſurface.

Dem. Let RB, RD, (fig. 7.) repreſent two diverging rays flowing from the point R as from a radiant, and falling the one perpendicularly, the other obliquely, on the convex ſurface BD, whoſe centre is C. Let DE be the reflected ray of the incident one RD, produce ED to F, and through R draw the line RH parallel to FE till it meets CD produced in H. Then will the angle RHD be equal to EDH the angle of reflection, as being alternate to it, and therefore equal alſo to RDH which is the angle of incidence; wherefore the triangle DRH is iſoſceles, and conſequently DR is equal to RH. Now the lines FD and RH being parallel, the triangles FDC and RHC are ſimilar, (or, to expreſs it in Euclid's way, the ſides of the triangle RHC are cut proportionably, 2 Elem. 6.): and therefore FD is to RH, or its equal RD, as CF to CR; but BD vaniſhing, FD and RD differ not from FB and RB: wherefore FB is to RB alſo, as CF to CR; that is, the diſtance of the focus from the ſurface is to the diſtance of the radiant point from the ſame, as the diſtance of the focus from the centre is to the diſtance of the radiant from thence. *Q. E. D.*

Case 2. Of converging rays falling upon a concave ſurface.

Dem. Let KD and CB be the converging incident rays having their imaginary focus in the point R, which was the radiant in the foregoing caſe. Then as RD was in that caſe reflected into DE, KD will in this be reflected into DF; for, ſince the angles of incidence in both caſes are equal, as they are by being vertical, the angles of reflection will be ſo too; ſo that F will be the focus of the reflected rays: but it was there demonſtrated, that FB is to RB as CF to CR; that is, the diſtance of the focus from the ſurface is to the diſtance (in this caſe) of the imaginary focus of the incident rays, as the diſtance of the focus from the centre is to the diſtance of the imaginary focus of the incident rays from the ſame. *Q. E. D.*

Case 3. Of converging rays falling upon a convex ſurface, and tending to a point between the focus of parallel rays and the centre.

Plate CCCLIX.

Dem. Let BD (fig. 8.) repreſent a convex ſurface whoſe centre is C, and whoſe focus of parallel rays is P; and let AB, KD, be two converging rays incident upon it, and having their imaginary focus at R, a point between P and C. Now becauſe KD tends to a point between the focus of parallel rays and the centre, the reflected ray DE will diverge from ſome point on the other ſide the centre, ſuppoſe F; as explained above (p. 308.) under Prop. 7. Through D draw the perpendicular CD and produce it to H; then will KDH and HDE be the angles of incidence and reflection, which being equal, their vertical ones RDC and CDF will be ſo too, and therefore the vertex of the triangle RDF is biſected by the line DC: wherefore (3 El. 6.) FD and DR, or BD vaniſhing, FB and BR are to each other as FC to CR; that is, the diſtance of the focus of the reflected rays is to that of the imaginary focus of the incident ones, as the diſtance of the former from the centre is to the diſtance of the latter from the ſame. *Q. E. D.*

Case 4. Of diverging rays falling upon a concave ſurface, and proceeding from a point between the focus of parallel rays and the centre.

Dem. Let RB, RD, (fig. 8.) be the diverging rays incident upon the concave ſurface BD, having their radiant point in the point R, the imaginary focus of the incident rays in the foregoing caſe. Then as KD was in that caſe reflected into DE, RD will now be reflected into DF. But it was there demonſtrated, that FB and RB are to each other as CF to CR; that is, the diſtance of the focus is to that of the radiant as the diſtance of the former from the centre is to the diſtance of the latter from the ſame. *Q. E. D.*

The angles of incidence and reflection being equal, it is evident, that if, in any caſe, the reflected ray be made the incident one, the incident will become the reflected one; and therefore the four following caſes may be conſidered reſpectively as the converſe of the four foregoing; for in each of them the incident rays are ſuppoſed to coincide with the reflected ones in the other. Or they may be demonſtrated independently of them, as follows.

Case 5. Of converging rays falling upon a convex ſurface, and tending to a point nearer the ſurface than the focus of parallel rays.

Dem. Let ED, RB (fig. 7.) be the converging rays incident upon the convex ſurface BD whoſe centre is C, and focus of parallel rays is P; and let the imaginary focus of the incident rays be at F, a point between P and B; and let DR be the reflected ray. From C and R draw the lines CH, RH, the one paſſing through D, the other parallel to FE. Then will the angle RHD be equal to HDE the angle of incidence, as alternate to it; and therefore equal to HDR, the angle of reflection: wherefore the triangle HDR is iſoſceles, and conſequently DR is equal to RH. Now the lines FD and RH being parallel, the triangles FDC and RHC are ſimilar; and therefore RH, or RD, is to FD as CR to CF: but BD vaniſhing, RD and FD coincide with RB and FB, wherefore RB is to FB as CR to CF; that is, the diſtance of the focus from the ſurface is to the diſtance of the imaginary focus of the incident rays, as the diſtance of the focus from the centre is to the diſtance of the imaginary focus of the incident rays from the ſame. *Q. E. D.*

Case 6. Of diverging rays falling upon a concave ſurface, and proceeding from a point between the focus of parallel rays and the ſurface.

Dem. Let FD and FB repreſent two diverging rays flowing from the point F as a radiant, which was the imaginary focus of the incident rays in the foregoing caſe. Then as ED was in that caſe reflected into DR, FD will be reflected into DK (for the reaſon mentioned in Caſe 2.), ſo that the reflected ray will proceed as from the point R: but it was demonſtrated in the caſe immediately foregoing, that RB is to FB as CR to CF; that is, the diſtance of the focus from the ſurface is to that of the radiant from the ſame, as the diſtance of the former from the centre is to that of the latter from the ſame. *Q. E. D.*

Case 7. Of converging rays falling upon a convex ſurface, and tending towards a point beyond the centre.

Dem. Let AB, ED (fig. 8.) be the incident rays tending to F, a point beyond the centre C, and let DK be the reflected ray of the incident one ED. Then becauſe the incident ray ED tends to a point beyond the centre, the reflected ray DK will proceed as from one on the contrary ſide, ſuppoſe R; as explained above under Prop. VII. Through D draw the perpendicular CD, and produce it to H. Then will EDH and HDK be the angles of incidence and reflection; which being equal, their vertical ones CDF and CDR will be ſo too: conſequently the vertex of the triangle FDR is biſected by the line CD: wherefore, RD is to DF, or (3 Elem. 6.) BD vaniſhing, RB is to BF as RC to CF; that is, the diſtance of the focus of the reflected rays is to that of the imaginary focus of the incident rays, as the diſtance of the former from the centre is to the diſtance of the latter from the ſame. *Q. E. D.*

Case 8. Of diverging rays falling upon a concave ſurface, and proceeding from a point beyond the centre.

Dem. Let FB, FD, be the incident rays having their radiant in F, the imaginary focus of the incident rays in the foregoing caſe. Then as ED was in that caſe reflected into DK, FD will now be reflected into DR; ſo that R will be the focus of the reflected rays. But it was demonſtrated in the foregoing caſe, that RB is to FB as RC to CF; that is, the diſtance of the focus of the reflected rays from the ſurface is to the diſtance of the radiant from the ſame, as the diſtance of the focus of the reflected rays from the centre is to the diſtance of the radiant from thence. *Q. E. D.*

The two remaining caſes may be conſidered as the converſe of thoſe under Prop. II. (p. 309, 310.), becauſe the

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the incident rays in theſe are the reflected ones in them; or they may be demonſtrated in the ſame manner with the foregoing, as follows.

Case 9. Converging rays falling upon a convex ſurface, and tending to the focus of parallel rays, become parallel after reflection.

Plate CCCLIX.

Dem. Let ED, RB (fig. 7.) repreſent two converging rays incident on the convex ſurface BD, and tending towards F, which we will now ſuppoſe to be the focus of parallel rays: and let DR be the reflected ray, and C the centre of convexity of the reflecting ſurface. Through C draw the line CD, and produce it to H, drawing RH parallel to ED produced to F. Now it has been demonſtrated (Caſe 5. where the incident rays are ſuppoſed to tend to the point F), that RB is to FB as RC to CF; but F in this Caſe being ſuppoſed to be the focus of parallel rays, it is the middle point between C and B (by Prop. II.) and therefore FB and FC are equal; and conſequently the two other terms in the proportion, *viz* RB and RC, muſt be ſo too; which can only be upon the ſuppoſition that R is at an infinite diſtance from B; that is, that the reflected rays BR and DR be parallel. *Q. E. D.*

Case 10. Diverging rays falling upon a concave ſurface, and proceeding from the focus of parallel rays, become parallel after reflection.

Dem. Let RD, RB, (fig. 8.) be two diverging rays incident upon the concave ſurface BD, as ſuppoſed in Caſe 4. where it was demonſtrated that FB is to RB as CF to CR. But in the preſent caſe RB and CR are equal, becauſe R is ſuppoſed to be the focus of parallel rays; therefore FB and FC are ſo too; which cannot be unleſs F be taken at an infinite diſtance from B; that is, unleſs the reflected rays BF and DF be parallel. *Q. E. D.*

Obs. It is here obſervable, that in the caſe of diverging rays falling upon a convex ſurface (ſee fig. 7.), the farther the point D is taken from B, the nearer the point F, the focus of the reflected rays, approaches to B, while the radiant R remains the ſame. For it is evident from the curvature of a circle, that the point D (fig. 9.) may be taken ſo far from B, that the reflected ray DE ſhall proceed as from F, G, H, or even from B, or from any point between B and R; and the farther it is taken from B, the faſter the point from which it proceeds approaches towards R: as will eaſily appear if we draw ſeveral incident rays with their reſpective reflected ones, in ſuch manner that the angles of reflection may be all equal to their reſpective angles of incidence, as is done in the figure. The like is applicable to any of the other caſes of diverging or converging rays incident upon a ſpherical ſurface. This is the reaſon, that, when rays are conſidered as reflected from a ſpherical ſurface, the diſtance of the oblique rays from the perpendicular one is taken ſo ſmall, that it may be ſuppoſed to vaniſh.

From hence it follows, that if a number of diverging rays are incident upon the convex ſurface BD at the ſeveral points B, D, D,.&c. they ſhall not proceed after reflection as from any point in the line RB produced, but as from a curve line paſſing through the ſeveral points F, *f*, *f*, &c. The ſame is applicable in all the other caſes.

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Had the curvature BD (fig. 7.) been hyperbolical, having its foci in R and F, then R being the radiant (or the imaginary focus of incident rays), F would have been the focus of the reflected ones, and *vice verſa*, however diſtant the points B and D might be taken from each other. In like manner, had the curve BD (fig. 8) been elliptical, having its foci in F and R, the one of theſe being made the radiant (or imaginary focus of incident rays), the other would have been the focus of reflected ones, and *vice verſa*. For both in the hyperbola and ellipſis, lines drawn from each of their foci through any point make equal angles with the tangent to that point. Therefore, if the incident rays proceed to or from one of their foci, the reflected ones will all proceed as from or to the other. So that, in order that diverging or converging rays may be accurately reflected to or from a point, the reflecting ſurface muſt be formed by the revolution of an *hyperbola* about its longer axis, when the incident rays are ſuch, that their radiant or imaginary focus of incident rays ſhall fall on one ſide the ſurface, and the focus of the reflected ones on the other; when they are both to fall on the ſame ſide, it muſt be formed by the revolution of an *ellipſis* about its longer axis. However, upon account of the great facility with which ſpherical ſurfaces are formed, in compariſon of that with which ſurfaces formed by the revolution of any of the conic ſections about their axes are made, the latter are very rarely uſed. Add to this another inconvenience, *viz.* that the foci of theſe curves being mathematical points, it is but one point of the ſurface of an object that can be placed in any of them at a time; ſo that it is only in theory that ſurfaces formed by the revolution of theſe curves about their axes render reflection perfect.

189 Method of finding the focal diſtance of rays reflected from a convex ſurface.

Now, becauſe the focal diſtance of rays reflected from a ſpherical ſurface cannot be found by the analogy laid down in the third propoſition, without making uſe of the quantity ſought; we ſhall here give an inſtance whereby the method of doing it in all others will readily appear.

Prob. Let it be required to find the focal diſtance of diverging rays incident upon a convex ſurface, whoſe radius of convexity is 5 parts, and the diſtance of the radiant from the ſurface is 20.

Sol. Call the focal diſtance ſought x; then will the diſtance of the focus from the centre be $5-x$, and that of the radiant from the ſame 25, therefore by Prop. 3. we have the following proportion. *viz.* $x : 20 :: 5-x : 25$; and multiplying extremes together and means together, we have $25x = 100-20x$, which, after due reduction, gives $x=\frac{100}{45}$.

If in any caſe it ſhould happen that the value of x ſhould be a negative quantity, the focal point muſt then be taken on the contrary ſide of the ſurface to that on which it was ſuppoſed that it would fall in ſtating the problem.

If letters inſtead of figures had been made uſe of in the foregoing ſolution, a general theorem might have been raiſed, to have determined the focal diſtance of reflected rays in all caſes whatever. See this done in Suppl. to *Gregory's Optics*, 2d Edit. p. 112

Becauſe it was, in the preceding ſection, obſerved, that different incident rays, though tending to or from one point, would after refraction proceed to or from

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different points, a method was there inſerted of determining the diſtinct point which each ſeparate ray entering a ſpherical ſurface converges to, or diverges from, after refraction: the ſame has been obſerved here with regard to rays reflected from a ſpherical ſurface (ſee Obſ. in Caſe 2. and Caſe 10.) But the method of determining the diſtinct point to or from which any given incident ray proceeds after reflection, is much more ſimple. It is only neceſſary to draw the reflected ray ſuch, that the angle of reflection may be equal to the angle of incidence, which will determine the point it proceeds to or from in any caſe whatever.

§ 3. *Of the Appearance of Bodies ſeen by Light reflected from plane and ſpherical Surfaces.*

Whatever has been ſaid concerning the appearance of bodies ſeen by refracted light through lenſes, reſpects alſo the appearance of bodies ſeen by reflection. But beſides theſe, there is one thing peculiar to images by reflection, viz. that each point in the repreſentation of an object made by reflection appears ſituated ſomewhere in an infinite right line that paſſes through its correſpondent point in the object, and is perpendicular to the reflecting ſurface.

The truth of this appears ſufficiently from the propoſitions formerly laid down: in each of which, rays flowing from any radiant point, are ſhown to proceed after reflection to or from ſome point in a line that paſſes through the ſaid radiant, and is perpendicular to the reflecting ſurface. For inſtance (fig. 1.), rays flowing from Y are collected in X, a point in the perpendicular CD, which, being produced, paſſes through Y: again (fig. 2.), rays flowing from G, proceed, after reflection, as from N, a point in the perpendicular CD, which, being produced, paſſes through G; and ſo of the reſt.

Plate CCCLIX.

This obſervation, however, except where an object is ſeen by reflection from a plain ſurface, relates only to thoſe caſes where the repreſentation is made by means of ſuch rays as fall upon the reflecting ſurface with a very ſmall degree of obliquity; becauſe ſuch as fall at a conſiderable diſtance from the perpendicular, proceed not after reflection as from any point in that perpendicular, but as from other points ſituated in a certain curve, as hath already been explained; upon which account theſe rays are neglected, as making a confuſed and deformed repreſentation. And therefore it is to be remembered, that however the ſituation of the eye with reſpect to the object and reflecting ſurface may be repreſented in the following figures, it is to be ſuppoſed as ſituated in ſuch a manner with reſpect to the object, that rays flowing from thence and entering it after reflection, may be ſuch only as fall with a very ſmall degree of obliquity upon the ſurface; that is, the eye muſt be ſuppoſed to be placed almoſt directly behind the object, or between it and the reflecting ſurface. The reaſon why it is not always ſo placed, is only to avoid confuſion in the figures.

190 The appearance of objects reflected from plane ſurfaces.

I. When an object is ſeen by reflection from a plane ſurface, the image of it appears at the ſame diſtance behind the ſurface that the object is placed before it, of the ſame magnitude therewith, and directly oppoſite to it.

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To explain this, let AB (fig. 10.) repreſent an object ſeen by reflection from the plane ſurface SV; and let the rays AF, AG, be ſo inclined to the ſurface, that they ſhall enter an eye at H after reflection; and let AE be perpendicular to the ſurface: then, by the obſervation juſt mentioned, the point A will appear in ſome part of the line AE produced, ſuppoſe I; that is, the oblique rays AF and AG will proceed after reflection as from that point: and further, becauſe the reflected rays FH, GK, will have the ſame degree of inclination to one another that their incident ones have, that point muſt neceſſarily be at the ſame diſtance from the ſurface that the point A is; the repreſentation therefore of the point A will be at the ſame diſtance behind the ſurface that the point itſelf is before it, and directly oppoſite to it: conſequently, ſince the like may be ſhown of the point B, or of any other, the whole image IM will appear at the ſame diſtance behind the ſurface that the object is before it, and directly oppoſite to it; and becauſe the lines AI, BM, which are perpendicular to the plain ſurface, are for that reaſon parallel to each other, it will alſo be of the ſame magnitude therewith.

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II. When an object is ſeen by reflection from a convex ſurface, its image appears nearer to the ſurface, and leſs than the object.

Let AB (fig. 12.) repreſent the object, SV a reflecting ſurface whoſe centre of convexity is C: and let the rays AF, AG, be ſo inclined to the ſurface, that after reflection therefrom, they ſhall enter the eye at H: and let AE be perpendicular to the ſurface; then will the oblique rays AF, AG, proceed after reflection as from ſome point in the line AE produced, ſuppoſe from I; which point, becauſe the reflected rays will diverge more than the incident ones, muſt be nearer to the ſurface then the point A. And ſince the ſame is alſo true of the rays which flow from B, or any other point, the repreſentation IM will be nearer to the ſurface than the object; and becauſe it is terminated by the perpendiculars AE and BF, which incline to each other, as concurring at the centre, it will alſo appear leſs.

192 From concave ſurfaces.

III. When an object is ſeen by reflection from a concave ſurface, the repreſentation of it is various, both with regard to its magnitude and ſituation, according as the diſtance of the object from the reflecting ſurface is greater or leſs.

1. When the object is nearer to the ſurface than its focus of parallel rays, the image falls on the oppoſite ſide of the ſurface, is more diſtant from it, and larger than the object.

Thus, let AB (fig. 13.) be the object, SV the reflecting ſurface, F the focus of parallel rays, and C its centre. Through A and B, the extremities of the object, draw the lines CE, CR, which will be perpendicular to the ſurface; and let the rays AR, AG, be incident upon ſuch points of it that they ſhall be reflected into an eye at H. Now, becauſe the radiant points A and B are nearer the ſurface than F the focus of parallel rays, the reflected rays will diverge, and will therefore proceed as from ſome points on the oppoſite ſide of the ſurface; which points, by the obſervation laid down at the beginning of this ſection, will be in the perpendiculars AE, BR, produced, ſuppoſe in I and M: but they will diverge in a leſs degree than their incident ones (ſee the propoſition juſt referred to); and therefore the ſaid points will be farther from the ſurface than the points A and B. The image therefore will be on the oppoſite ſide of the ſurface with reſpect to the object: it will be more diſtant than it; and conſequently being terminated by the perpendiculars CI and CM, it will alſo be larger.

2. When the object is placed in the focus of parallel rays, the reflected rays enter the eye parallel; in which caſe the image ought to appear at an infinite diſtance behind the reflecting ſurface: but the repreſentation of it, for the like reaſons that were given in the foregoing caſe, being large and diſtinct, we judge it not much farther from the ſurface than the image.

3. When the object is placed between the focus of parallel rays and the centre, the image falls on the oppoſite ſide of the centre, is larger than the object, and in an inverted poſition.

Plate CCLIX.

Thus let AB (fig. 14.) repreſent the object, SV the reflecting ſurface, F its focus of parallel rays, and C its centre. Through A and B, the extremities of the object, draw the lines CE and CN, which will be perpendicular to the ſurface; and let AR, AG, be a pencil of rays flowing from A. Theſe rays proceeding from a point beyond the focus of parallel rays, will after reflection converge towards ſome point on the oppoſite ſide the centre, which will fall upon the perpendicular EC produced, but at a greater diſtance from C than the radiant A from which they diverged. For the ſame reaſon, rays flowing from B will converge to a point in the perpendicular NC produced, which ſhall be farther from C than the point B; from whence it is evident, that the image IM is larger than the object AB, that it falls on the contrary ſide the centre, and that their poſitions are inverted with reſpect to each other.

4. If the object be placed beyond the centre of convexity, the image is then formed between the centre and the focus of parallel rays, is leſs than the object, and its poſition is inverted.

This propoſition is the converſe of the foregoing: for as in that caſe rays proceeding from A were reflected to I, and from B to M; ſo rays flowing from I and M will be reflected to A and B; if therefore an object be ſuppoſed to be ſituated beyond the centre in IM, the image of it will be formed in AB between that and the focus of parallel rays, will be leſs than the object, and inverted.

5. If the middle of the object be placed in the centre of convexity of the reflecting ſurface, the object and its image will be coincident; but the image will be inverted with reſpect to the object.

That the place of the image and the object ſhould be the ſame in this caſe needs little explication; for the middle of the object being in the centre, rays flowing from thence will fall perpendicularly upon the ſurface, and therefore neceſſarily return thither again; ſo that the middle of the image will be coincident with the middle of the object. But that the image ſhould be inverted is perhaps not ſo clear. To explain this, let AB (fig. 15.) be the object, having its middle point C in the centre of the reflecting ſurface from SV; through the centre and the point R draw the line CR, which will be perpendicular to the reflecting ſurface; join the points AR and BR, and let AR repreſent a ray flowing from A; this will be reflected into RB: for C being the middle point between A and B, the angles ARC and CRB are equal; and a ray from B will likewiſe be reflected to A; and therefore the poſition of the image will be inverted with reſpect to that of the object.

In this propoſition it is to be ſuppoſed, that the object AB is ſo ſituated with reſpect to the reflecting ſurface, that the angle ACR may be right; for otherwiſe the angles ARC and BRC will not be equal, and part of the image will therefore fall upon the object and part off.

6. If in any of the three laſt caſes, in each of which the image is formed on the ſame ſide of the reflecting ſurface with the object, the eye be ſituated farther from the ſurface than the place where the image falls, the rays of each pencil, croſſing each other in the ſeveral points of the image, will enter the eye as from a real object ſituated there; ſo that the image will appear pendulous in the air between the eye and the reflecting ſurface, and in the poſition wherein it is formed, viz. inverted with reſpect to the object, in the ſame manner that an image formed by refracted light appears to an eye placed beyond it; which was fully explained under Prop. IV. (p. 304.), and therefore needs not be repeated.

But as what relates to the appearance of the object when the eye is placed nearer to the ſurface than the image, was not there fully inquired into, that point ſhall now be more ſtrictly examined under the following caſe, which equally relates to refracted and reflected light.

7. If the eye be ſituated between the reflecting ſurface and the place of the image, the object is then ſeen beyond the ſurface; and the farther the eye recedes from the ſurface towards the place of the image, the more confuſed, larger, and nearer, the object appears.

To explain this, let AB (fig. 16.) repreſent the object; IM its image, one of whoſe points M is formed by the concurrence of the reflected rays DM, EM, &c. which before reflection came from B; the other, I, by the concurrence of DI, EI, &c. which came from A: and let *ab* be the pupil of an eye, ſituated between the ſurface DP and the image. This pupil will admit the rays H*a*, K*b*; which, becauſe they are tending towards I, are ſuch as came from A, and therefore the point A will appear diffuſed over the ſpace RS. In like manner the pupil will alſo receive into it the reflected rays K*a* and L*b*, which, becauſe they are tending towards M, by ſuppoſition came from B; and therefore the point B will be ſeen ſpread as it were over the ſpace TV, and the object will ſeem to fill the ſpace RV; but the repreſentation of it will be confuſed, becauſe the intermediate points of the object being equally enlarged in appearance, there will not be room for them between the points S and T, but they will coincide in part one with another: for inſtance, the appearance of that point in the object, whoſe repreſentation falls upon *c* in the image, will fill the ſpace *mn*; and ſo of the reſt. Now, if the ſame pupil be removed into the ſituation *e f*, the reflected rays E *e* and G *f* will then enter the eye, and therefore one extremity of the object will appear to cover the ſpace XY; and becauſe the rays O *f* and L *e* will alſo enter it in their progreſs towards M, the point B, from whence they came, will appear to cover ZV; the object therefore will appear larger and more confuſed than before. And when the eye recedes quite to the image, it ſees but one ſingle point of the object, and that appears diffuſed all over the reflecting ſurface: for inſtance, if the eye recedes to the point M, then rays flowing from the point B enter it upon whatever part of the ſurface they fall; and ſo for the reſt. The object alſo appears nearer to the ſurface the farther the eye recedes from it towards the place of the image; probably becauſe, as the appearance of the object becomes more and more confuſed, its place is not ſo eaſily diſtinguiſhed from that of the reflecting ſurface itſelf, till at laſt when it is quite confuſed (as it is when the eye is arrived at M) they both appear as one, the ſurface aſſuming the colour of the object.

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The apparent magnitude of an object ſeen by reflection from a concave ſurface.

As to the preciſe apparent magnitude of an object ſeen after this manner, it is ſuch that the angle it appears under ſhall be equal to that which the image of the ſame object would appear under were we to ſuppoſe it ſeen from the ſame place: that is, the apparent object (for ſuch we muſt call it, to diſtinguiſh it from the image of the ſame object) and the image ſubtend equal angles at the eye.

Dem. Here we muſt ſuppoſe the pupil of the eye to be a point only, becauſe the magnitude of that cauſes ſmall alteration in the apparent magnitude of the object; as we ſhall ſee by and by. Let then the point *a* repreſent the pupil, then will the extreme rays that can enter it be H *a* and K *a*; the object therefore will appear under the angle H *a* K, which is equal to its vertical one M *a* I, under which the image IM would appear were it to be ſeen from *a*. Again, If the eye be placed in *f*, the object appears under the angle G *f* O equal to I *f* M, which the image ſubtends at the ſame place, and therefore the apparent object and image of it ſubtend equal angles at the eye. *Q. E. D.*

Now if we ſuppoſe the pupil to have any ſenſible magnitude, ſuch, ſuppoſe, that its diameter may be *a b*; then the object ſeen by the eye in that ſituation will appear under the angle HXL, which is larger than the angle H *a* K, under which it appeared before; becauſe the angle at X is nearer than the angle at *a*, to the line IM, which is a ſubtenſe common to them both.

From this propoſition it follows; that, were the eye cloſe to the ſurface at K, the real and apparent object would be ſeen under equal angles (for the real object appears from that place under the ſame angle that the image does, as will be ſhown at the end of this ſection); therefore, when the eye is nearer to the image than that point, the image will ſubtend a larger angle at it than the object does; and conſequently, ſince the image and apparent object ſubtend equal angles at the eye, the apparent object muſt neceſſarily be ſeen under a larger angle than the object itſelf, wherever the eye be placed, between the ſurface and the image.

As each point in the repreſentation of an object made by reflection is ſituated ſomewhere in a right line that paſſes through its correſpondent point in the object, and is perpendicular to the reflecting ſurface, as was ſhown in the beginning of this ſection; we may from hence deduce a moſt eaſy and expeditious method of determining both the magnitude and ſituation of the image in all caſes whatever. Thus,

Plate CCCLIX.

Through the extremities of the object AB and the centre C (fig. 17, 18, or 19.) draw the lines AC BC, and produce them as the caſe requires; theſe lines will be perpendicular to the reflecting ſurface, and therefore the extremities of the image will fall upon them. Through F the middle point of the object and the centre, draw the line FC, and produce it till it paſſes through the reflecting ſurface; this will alſo be perpendicular to the ſurface. Through G, the point where this line cuts the ſurface, draw the lines AG and BG, and produce them this way or that, till they croſs the former perpendiculars; and where they croſs, there I and M the extremities of the image will fall. For ſuppoſing AG to be a ray proceeding from the point A and falling upon G, it will be reflected to B; becauſe FA is equal to FB, and FG is perpendicular to the reflecting ſurface; and therefore the repreſentation of the point A will be in BG produced as well as in AC; conſequently it will fall on the point I, where they croſs each other. Likewiſe the ray BG will for the ſame reaſon be reflected to A; and therefore the repreſentation of the point B will be in AG produced, as well as in ſome part of BC, that is, in M where they croſs. From whence the propoſition is clear.

If it happens that the lines will not croſs which way ſoever they are produced, as in (fig. 20), then is the object in the focus of parallel rays of that ſurface, and has no image formed in the place whatever. For in this caſe the rays AH, AG, flowing from the point A, become parallel after reflection in the lines HC, GB, and therefore do not flow as to or from any point: in like manner, rays flowing from B are reflected into the parallel lines KB and GA; ſo that no repreſentation can be formed by ſuch reflection.

From hence we learn another circumſtance relating to the magnitude of the image made by reflection; viz. that it ſubtends the ſame angle at the vertex of the reflecting ſurface that the object does. This appears by inſpection of the 17th, 18th, or 19th figure, in each of which the angle IGM, which the image ſubtends at G the vertex of the reflecting ſurface, is equal to the angle AGB, which the object ſubtends at the ſame place; for in the two firſt of thoſe figures they are vertical, in the third they are the ſame. And,

Further, The angle ICM, which the image ſubtends at the centre, is alſo equal to the angle ACB which the object ſubtends at the ſame place; for in the two firſt figures they are the ſame, in the laſt they are vertical to each other.

From whence it is evident, that the object and its image are to each other in diameter, either as their reſpective diſtances from the vertex of the reflecting ſurface, or as their diſtances from the centre of the ſame.

Light differently refrangible.

IV. As objects are multiplied by being ſeen thro' tranſparent media, whoſe ſurfaces are properly diſpoſed, ſo they may alſo by reflecting ſurfaces. Thus,

Plate CCLIX.

1. If two reflecting ſurfaces be diſpoſed at right angles, as the ſurfaces AB, BC, (fig. 21.), an object at D may be ſeen by an eye at E, after one reflection at F, in the line EF produced; after two reflections, the firſt at G, the ſecond at H, in the line EH produced; and alſo, after one reflection made at A, in the line EA produced.

2. If the ſurfaces be parallel, as AB, CD, (fig. 22.), and the object be placed at E and the eye at F, the object will appear multiplied an infinite number of times: thus it may be ſeen in the line FG produced, after one reflection at G; in the line FH produced, after two reflections, the firſt at I, the ſecond at H; and alſo in FP produced, after ſeveral ſucceſſive reflections of the ray EL, at the points L, M, N, O, and P; and ſo on *in infinitum*. But the greater the number of reflections are, the weaker their repreſentation will be.

SECT. IV. *Of the different Refrangibility of Light.*

As this property of light ſolves a great number of the phenomena which could not be underſtood by former opticians, we ſhall give an account of it in the words of Sir Iſaac Newton, who firſt diſcovered it; eſpecially as his account is much more full, clear, and perſpicuous, than thoſe of ſucceeding writers.

Plate CCLX.

"In a very dark chamber, at a round hole F (fig. 1.), about one third of an inch broad, made in the ſhut of a window, I placed a glaſs priſm ABC, whereby the beam of the ſun's light, SF, which came in at that hole, might be refracted upwards, toward the oppoſite wall of the chamber, and there form a coloured image of the ſun, repreſented at PT. The axis of the priſm (that is, the line paſſing through the middle of the priſm, from one end of it to the other end, parallel to the edge of the refracting angle) was in this and the following experiments perpendicular to the incident rays. About this axis I turned the priſm ſlowly, and ſaw the refracted light on the wall, or coloured image of the ſun, firſt to deſcend, and then to aſcend. Between the deſcent and aſcent, when the image ſeemed ſtationary, I ſtopped the priſm and fixed it in that poſture.

"Then I let the refracted light fall perpendicularly upon a ſheet of white paper, MN, placed at the oppoſite wall of the chamber, and obſerved the figure and dimenſions of the ſolar image, PT, formed on the paper by that light. This image was oblong, and not oval, but terminated by two rectilinear and parallel ſides and two ſemicircular ends. On its ſides it was bounded pretty diſtinctly; but on its ends very confuſedly and indiſtinctly, the light there decaying and vaniſhing by degrees. At the diſtance of 18½ feet from the priſm the breadth of the image was about 2⅛ inches, but its length was about 10¾ inches, and the length of its rectilinear ſides about 8 inches; and ACB, the refracting angle of the priſm, whereby ſo great a length was made, was 64 degrees. With a leſs angle the length of the image was leſs, the breadth remaining the ſame. It is farther to be obſerved, that the rays went on in ſtraight lines from the priſm to the image, and therefore at their going out of the priſm had all that inclination to one another from which the length of the image proceeded. This image PT was coloured, and the more eminent colours lay in this order from the bottom at T to the top at P; red, orange, yellow, green, blue, indigo, violet; together with all their intermediate degrees in a continual ſucceſſion perpetually varying."

194 Light conſiſts of ſeveral ſorts of coloured rays differently refrangible.

Our author concludes from this experiment, and many more to be mentioned hereafter, "that the light of the ſun conſiſts of a mixture of ſeveral ſorts of coloured rays, ſome of which at equal incidences are more refracted than others, and therefore are called *more refrangible*. The red at T, being neareſt to the place Y, where the rays of the ſun would go directly if the priſm was taken away, is the leaſt refracted of all the rays; and the orange, yellow, green, blue, indigo, and violet, are continually more and more refracted, as they are more and more diverted from the courſe of the direct light. For by mathematical reaſoning he has proved, that when the priſm is fixed in the poſture above-mentioned, ſo that the place of the image ſhall be the loweſt poſſible, or at the limit between its deſcent and aſcent, the figure of the image ought then to be round like the ſpot at Y, if all the rays that tended to it were equally refracted. Therefore, ſeeing by experience it is found that this image is not round, but about five times longer than broad, it follows, that all the rays are not equally refracted. And this concluſion is farther confirmed by the following experiments.

"In the ſun-beam SF (fig. 2.), which was propagated into the room thro' the hole in the window-ſhut EG, at the diſtance of ſome feet from the hole, I held the priſm ABC in ſuch a poſture, that its axis might be perpendicular to that beam: then I looked through the priſm upon the hole F, and turning the priſm to and fro about its axis to make the image *p t* of the hole aſcend and deſcend, when between its two contrary motions it ſeemed ſtationary, I ſtopped the priſm; in this ſituation of the priſm, viewing through it the ſaid hole E, I obſerved the length of its refracted image *p t* to be many times greater than its breadth; and that the moſt refracted part thereof appeared violet at *p*; the leaſt refracted red, at *t*; and the middle parts indigo, blue, green, yellow, and orange, in order. The ſame thing happened when I removed the priſm out of the ſun's light, and looked through it upon the hole ſhining by the light of the clouds beyond it. And yet if the refractions of all the rays were equal according to one certain proportion of the ſines of incidence and refraction, as is vulgarly ſuppoſed, the refracted image ought to have appeared round, by the mathematical demonſtration above-mentioned. So then by theſe two experiments it appears, that in equal incidences there is a conſiderable inequality of refractions."

For the diſcovery of this fundamental property of light, which has opened the whole myſtery of colours, we ſee our author was not only beholden to the experiments themſelves, which many others had made before him, but alſo to his ſkill in geometry; which was abſolutely neceſſary to determine what the figure of the refracted image ought to be upon the old principle of an equal refraction of all the rays: but hav-

Fig. 1.

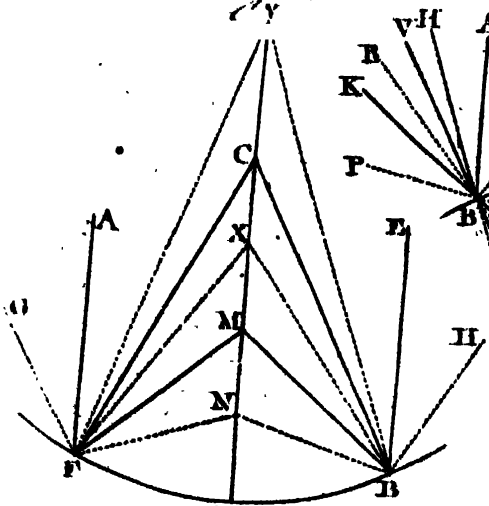


Fig. 2.

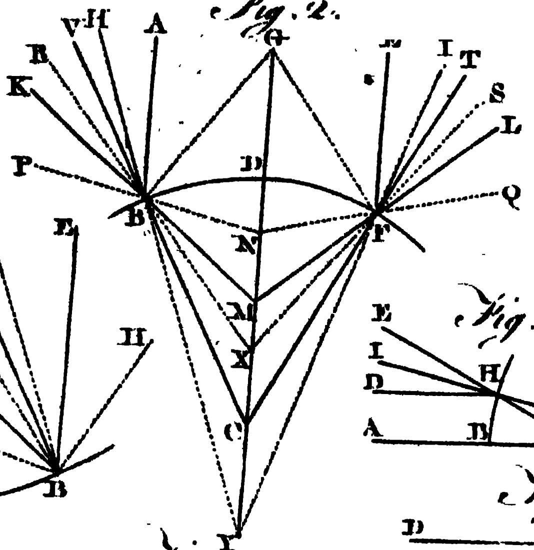


Fig. 3.

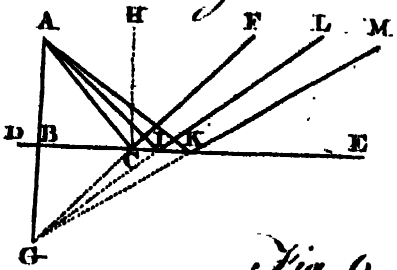


Fig. 4.

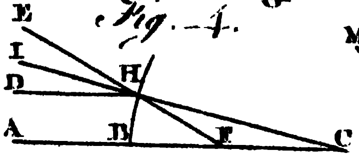


Fig. 5.

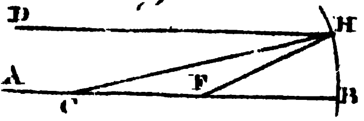


Fig. 6.

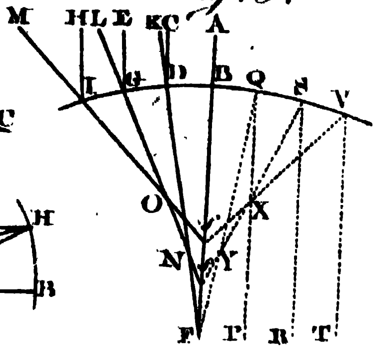


Fig. 7.

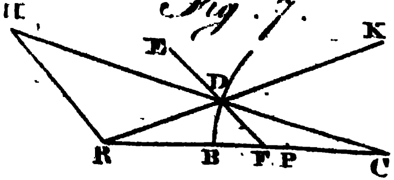


Fig. 8.

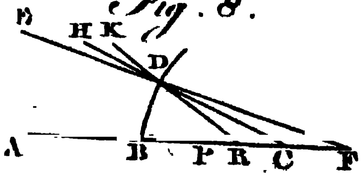


Fig. 9.

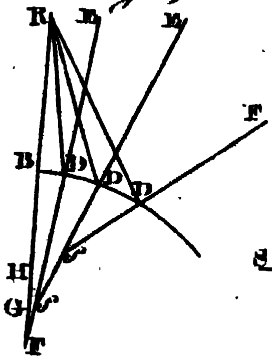


Fig. 10.

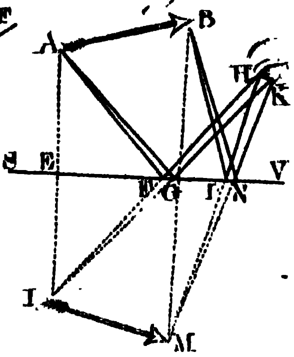


Fig. 11.

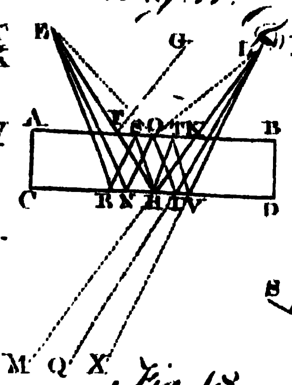
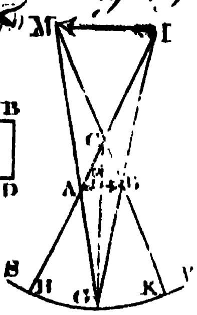


Fig. 19.



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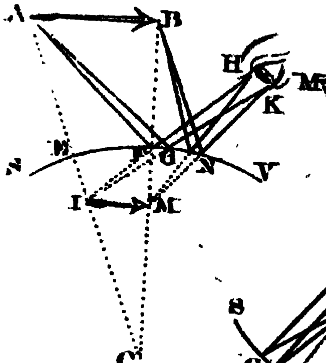


Fig. 14.

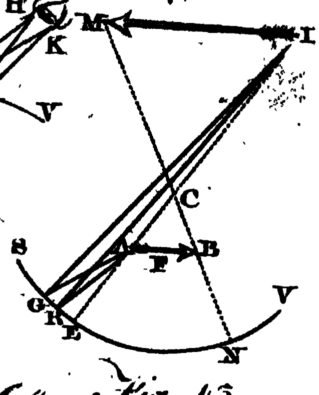


Fig. 16.

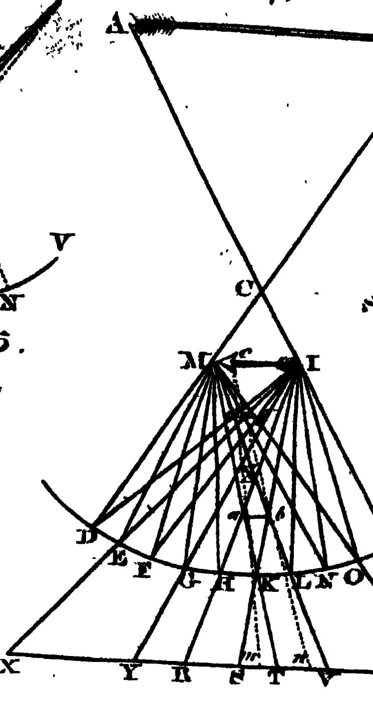


Fig. 17.

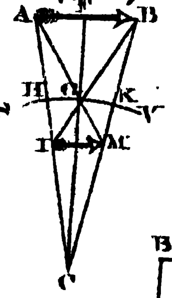


Fig. 18.

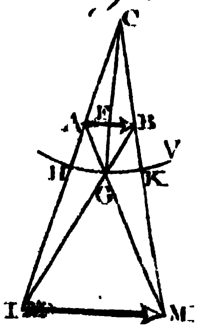


Fig. 20.

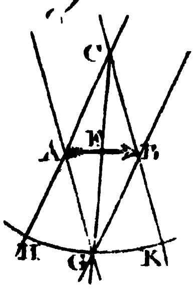


Fig. 13.

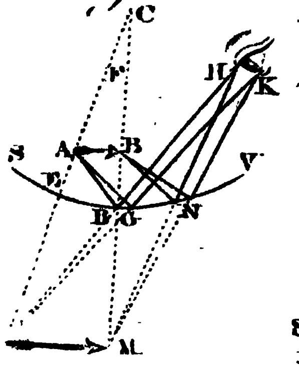


Fig. 15.

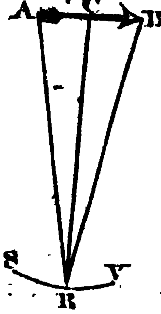


Fig. 21.

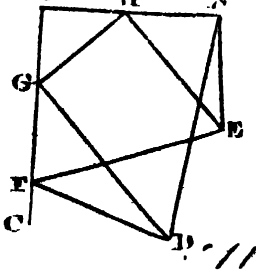
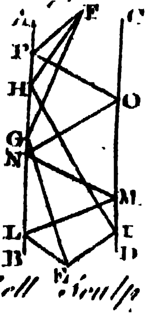


Fig. 22.



A Bell Sculp.

people in ſeeing all theſe experiments would be apt to frame. For the rays, to ſpeak properly, are not coloured. In them there is nothing elſe than a certain power and diſpoſition to ſtir up a ſenſation of this or that colour. For as ſound, in a bell or muſical ſtring or other ſounding body, is nothing but a trembling motion, and in the air nothing but that motion propagated from the object, and in the ſenſorium it is a ſenſe of that motion under the form of ſound; ſo colours in the object are nothing but a diſpoſition to reflect this or that ſort of rays more copiouſly than the reſt: in rays they are nothing but their diſpoſitions to propagate this or that motion into the ſenſorium; and in the ſenſorium they are ſenſations of thoſe motions under the forms of colours. See CHROMATICS.

197 Why the image of the ſun, by heteroge[illegible] paſſing through a priſm, is oblong. Plate CCCLX.

“By the mathematical propoſition above-mentioned, it is certain that the rays which are equally refrangible do fall upon a circle anſwering to the ſun's apparent diſk, which will alſo be proved by experiment by and by. Now let AG (fig. 5.) repreſent the circle which all the moſt refrangible rays, propagated from the whole diſk of the ſun, will illuminate and paint upon the the oppoſite wall if they were alone; EL the circle, which all the leaſt refrangible rays would in like manner illuminate if they were alone; BH, CI, DK, the circles which ſo many intermediate ſorts would paint upon the wall, if they were ſingly propagated from the ſun in ſucceſſive order, the reſt being intercepted; and conceive that there are other circles without number, which innumerable other intermediate ſorts of rays would ſucceſſively paint upon the wall, if the ſun ſhould ſucceſſively emit every ſort apart. And ſeeing the ſun emits all theſe ſorts at once, they muſt all together illuminate and paint innumerable equal circles; of all which, being according to their degrees of refrangibility placed in order in a continual ſeries, that oblong ſpectrum PT is compoſed, which was deſcribed in the firſt experiment.

“Now if theſe circles, whilſt their centres keep their diſtances and poſitions, could be made leſs in diameter, their interfering one with another, and conſequently the mixture of the heterogeneous rays, would be proportionably diminiſhed. Let the circles AG, BH, CI, &c. remain as before; and let *ag*, *bh*, *ci*, &c. be ſo many leſs circles lying in a like continual ſeries, between two parallel right lines *ae* and *gl*, with the ſame diſtance between their centres, and illuminated with the ſame ſorts of rays: that is, the circle *ag* with the ſame ſort by which the correſponding circle AG was illuminated; and the reſt of the circles *bh*, *ci*, *dk*, *el* reſpectively with the ſame ſorts of rays by which the correſponding circles BH, CI, DK, EL, were illuminated. In the figure PT, compoſed of the great circles, three of thoſe, AG, BH, CI, are ſo expanded into each other, that three ſorts of rays, by which thoſe circles are illuminated, together with innumerable other ſorts of intermediate rays, are mixed at QR in the middle of the circle BH. And the like mixture happens throughout almoſt the whole length of the figure PT. But in the figure *pt*, compoſed of the leſs circles, the three leſs circles *ag*, *bh*, *ci*, which anſwer to thoſe three greater, do not extend into one another; nor are there anywhere mingled ſo much as any two of the three ſorts of rays by which thoſe circles are illuminated, and which in the figure PT are all of them intermingled at QR. So then, if we would diminiſh the mixture of the rays, we are to diminiſh the diameters of the circles. Now theſe would be diminiſhed if the ſun's diameter, to which they anſwer, could be made leſs than it is, or (which comes to the ſame purpoſe) if without doors, at great diſtance from the priſm towards the ſun, ſome opaque body were placed with a round hole in the middle of it to intercept all the ſun's light, except ſo much as coming from the middle of his body could paſs through that hole to the priſm. For ſo the circles AG, BH, and the reſt, would not any longer anſwer to the whole diſk of the ſun, but only to that part of it which could be ſeen from the priſm through that hole; that is, to the apparent magnitude of that hole viewed from the priſm. But that theſe circles may anſwer more diſtinctly to that hole, a lens is to be placed by the priſm to caſt the image of the hole (that is, every one of the circles AG, BH, &c.) diſtinctly upon the paper at PT; after ſuch a manner, as by a lens placed at a window the pictures of objects abroad are caſt diſtinctly upon a paper within the room. If this be done, it will not be neceſſary to place that hole very far off, no not beyond the window. And therefore, inſtead of that hole, I uſed the hole in the window-ſhut as follows:

“In the ſun's light let into my darkened chamber through a ſmall round hole in my window-ſhut, at about 10 or 12 feet from the window, I placed a lens MN (fig. 6.), by which the image of the hole F might be diſtinctly caſt upon a ſheet of white paper placed at I. Then immediately after the lens I placed a priſm ABC, by which the trajected light might be refracted either upwards or ſidewiſe, and thereby the round image which the lens alone did caſt upon the paper at I, might be drawn out into a long one with parallel ſides, as repreſented at *pt*. This oblong image I let fall upon another paper at about the ſame diſtance from the priſm as the image at I, moving the paper either towards the priſm or from it, until I found the juſt diſtance where the rectilinear ſides of the images *pt* become moſt diſtinct. For in this caſe the circular images of the hole, which compoſe that image, after the manner that the circles *ag*, *bh*, *ci*, &c. do the figure *pt*, were terminated moſt diſtinctly, and therefore extended into one another the leaſt that they could, and by conſequence the mixture of the heterogeneous rays was now the leaſt of all. The circles *ag*, *bh*, *ci*, &c. which compoſe the image *pt*, are each equal to the circle at I; and therefore, by diminiſhing the hole F, or by removing the lens farther from it, may be diminiſhed at pleaſure, whilſt their centres keep the ſame diſtances from each other. Thus, by diminiſhing the breadth of the image *pt*, the circles of heterogeneal rays that compoſe it may be ſeparated from each other as much as you pleaſe. Yet inſtead of the circular hole F, it is better to ſubſtitute an oblong hole ſhaped like a parallelogram, with its length parallel to the length of the priſm. For if this hole be an inch or two long, and but a 10th or 20th part of an inch broad, or narrower, the light of the image *pt* will be as ſimple as before, or ſimpler; and the image being much broader, is therefore fitter to have experiments tried in its light than before.

“Homogeneal light is refracted regularly without any dilatation, ſplitting, or ſhattering of the rays; and the confuſed viſion of objects ſeen through refracting bodies by heterogeneal light, ariſes from the different refrangibility of ſeveral ſorts of rays. This will appear by the experiments which will follow. In the middle of a black paper I made a round hole about a fifth or a ſixth part of an inch in diameter. Upon this part I cauſed the ſpectrum of homogeneal light, deſcribed in the former article, ſo to fall that ſome part of the light might paſs through the hole in the paper. This tranſmitted part of the light, I refracted with a priſm placed behind the paper: and letting the refracted light fall perpendicularly upon a white paper, two or three feet diſtant from the priſm, I found that the ſpectrum formed on the paper by this light was not oblong, as when it is made in the firſt experiment, by refracting the ſun's compound light, but was, ſo far as I could judge by my eye, perfectly circular, the length being nowhere greater than the breadth; which ſhows that this light is refracted regularly without any dilatation of the rays, and is an ocular demonſtration of the mathematical propoſition mentioned above.

198
The image of the ſun, by ſimple and homogeneous light, circular.

"In the homogeneal light I placed a paper circle of a quarter of an inch in diameter: and in the ſun's unrefracted, heterogeneal, white light, I placed another paper circle of the ſame bigneſs; and going from theſe papers to the diſtance of ſome feet, I viewed both circles through a priſm. The circle illuminated by the ſun's heterogeneal light appeared very oblong, as in the ſecond experiment, the length being many times greater than the breadth. But the other circle, illuminated with homogeneal light appeared circular, and diſtinctly defined, as when it is viewed by the naked eye; which proves the whole propoſition mentioned in the beginning of this article.

199
Viſion more diſtinct in homogeneal than in heterogeneous light.

"In the homogeneal light I placed flies and ſuch like minute objects, and viewing them through a priſm I ſaw their parts as diſtinctly defined as if I had viewed them with the naked eye. The ſame objects placed in the ſun's unrefracted heterogeneal light, which was white, I viewed alſo through a priſm, and ſaw them moſt confuſedly defined, ſo that I could not diſtinguiſh their ſmaller parts from one another. I placed alſo the letters of a ſmall print one while in the homogeneal light, and then in the heterogeneal; and viewing them through a priſm, they appeared in the latter caſe ſo confuſed and indiſtinct that I could not read them; but in the former, they appeared ſo diſtinct that I could read readily, and thought I ſaw them as diſtinct as when I viewed them with my naked eye: in both caſes, I viewed the ſame objects through the ſame priſm, at the ſame diſtance from me, and in the ſame ſituation. There was no difference but in the lights by which the objects were illuminated, and which in one caſe was ſimple, in the other compound; and therefore the diſtinct viſion in the former caſe, and confuſed in the latter, could ariſe from nothing elſe than from that difference in the lights. Which proves the whole propoſition.

"In theſe three experiments, it is farther very remarkable, that the colour of homogeneal light was never changed by the refraction. And as theſe colours were not changed by refractions, ſo neither were they by reflections. For all white, gray, red, yellow, green, blue, violet, bodies, as paper, aſhes, red lead, orpiment, indigo, bice, gold, ſilver, copper, graſs, blue flowers, violets, bubbles of water tinged with various colours, peacock feathers, the tincture of lignum nephriticum, and ſuch like, in red homogeneal light appeared totally red, in blue light totally blue, in green light totally green, and ſo of other colours. In the homogeneal light of any colour they all appeared totally of that ſame colour; with this only difference, that ſome of them reflected that light more ſtrongly, others more faintly. I never yet found any body which by reflecting homogeneal light could ſenſibly change its colour.

"From all which it is manifeſt, that if the ſun's light conſiſted of but one ſort of rays, there would be but one colour in the world, nor would it be poſſible to produce any new colour by reflections and refractions; and by conſequence, that the variety of colours depends upon the compoſition of light.

"The ſolar image *pt*, formed by the ſeparated rays in the 5th experiment, did in the progreſs from its end *p*, on which the moſt refrangible rays fell, unto its end *t*, on which the leaſt refrangible rays fell, appear tinged with this ſeries of colours; violet, indigo, blue, green, yellow, orange, red, together with all their intermediate degrees in a continual ſucceſſion perpetually varying; ſo that there appeared as many degrees of colours as there were ſorts of rays differing in refrangibility. And ſince theſe colours could not be changed by refractions nor by reflections, it follows, that all homogeneal light has its proper colour anſwering to its degree of refrangibility.

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Every homogeneal ray is refracted according to one and the ſame rule.

"Every homogeneal ray conſidered apart is refracted, according to one and the ſame rule; ſo that its ſine of incidence is to its ſine of refraction in a given ratio: that is, every different coloured ray has a different ratio belonging to it. This our author has proved by experiment, and by other experiments has determined by what numbers thoſe given ratios are expreſſed. For inſtance, if an heterogeneal white ray of the ſun emerges out of glaſs into air; or, which is the ſame thing, if rays of all colours be ſuppoſed to ſucceed one another in the ſame line AC, and AD (fig. 15.) their common ſine of incidence in glaſs be divided into 50 equal parts, then EF and GH, the ſines of refraction into air, of the leaſt and moſt refrangible rays, will be 77 and 78 ſuch parts reſpectively. And ſince every colour has ſeveral degrees, the ſines of refraction of all the degrees of red will have all intermediate degrees of magnitude from 77 to $77\frac{1}{8}$, of all the degrees of orange from $77\frac{1}{8}$ to $77\frac{1}{5}$, of yellow from $77\frac{1}{5}$ to $77\frac{1}{3}$, of green from $77\frac{1}{3}$ to $77\frac{1}{2}$, of blue from $77\frac{1}{2}$ to $77\frac{2}{3}$, of indigo from $77\frac{2}{3}$ to $77\frac{7}{9}$, and of violet from $77\frac{7}{9}$ of 78."

Plate CCLX.

PART II.

SECT. I. *The Application of the foregoing Theory to ſeveral natural Phenomena.*

§ 1. *Of the Rainbow.*

THIS beautiful phenomenon hath engaged the attention of all ages. By ſome nations it hath been deified; though the more ſenſible part always looked upon it as a natural appearance, and endeavoured, however imperfectly, to account for it. The obſervations of the ancients and philoſophers of the middle ages concerning the rainbow were ſuch as could not have eſcaped the notice of the moſt illiterate huſbandmen who gazed at the ſky; and their various hypotheſes deſerve no notice. It was a conſiderable time even after the dawn of true philoſophy in this weſtern part of the world, before we find any diſcovery of importance on this ſubject. Maurolycus was the firſt who pretended to have meaſured the diameters of the two rainbows with much exactneſs; and he reports that he found that of the inner bow to be 45 degrees, and that of the outer bow 56; from which Deſcartes takes occaſion to obſerve, how little we can depend upon the obſervations of thoſe who were not acquainted with the cauſe of the appearances.

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Knowledge of the nature of the rainbow a modern diſcovery.

One *Clichtovæus* (the ſame, it is probable, who diſtinguiſhed himſelf by his oppoſition to Luther, and who died in 1543) had maintained, that the ſecond bow is the image of the firſt, as he thought was evident from the inverted order of the colours. For, ſaid he, when we look into the water, all the images that we ſee reflected by it are inverted with reſpect to the objects themſelves; the tops of the trees, for inſtance, that ſtand near the brink, appearing lower than the roots.

That the rainbow is oppoſite to the ſun, had always been obſerved. It was, therefore, natural to imagine, that the colours of it were produced by ſome kind of reflection of the rays of light from drops of rain, or vapour. The regular order of the colours was another circumſtance that could not have eſcaped the notice of any perſon. But, notwithſtanding mere reflection had in no other caſe been obſerved to produce colours, and it could not but have been obſerved that refraction is frequently attended with that phenomenon, yet no perſon ſeems to have thought of having recourſe to a proper refraction in this caſe, before one *Fletcher* of Breſlaw, who, in a treatiſe which he publiſhed in 1571, endeavoured to account for the colours of the rainbow by means of a double refraction and one reflection. But he imagined that a ray of light, after entering a drop of rain, and ſuffering a refraction both at its entrance and exit, was afterwards reflected from another drop, before it reaches the eye of the ſpectator. He ſeems to have overlooked the reflection at the farther ſide of the drop, or to have imagined that all the bendings of the light within the drop would not make a ſufficient curvature to bring the ray of the ſun to the eye of the ſpectator. That he ſhould think of two refractions, was the neceſſary conſequence of his ſuppoſing that the ray entered the drop at all. This ſuppoſition, therefore, was all the light that he threw upon the ſubject. B. Porta ſuppoſed that the rainbow is produced by the refraction of light in the whole body of rain or vapour, but not in the ſeparate drops.

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Approach towards it made by Fletcher of Breſlaw.

After all, it was a man whom no writers allow to have had any pretenſions to philoſophy, that hit upon this curious diſcovery. This was Antonio De Dominis, biſhop of Spalatro, whoſe treatiſe *De Radiis Viſus et Lucis*, was publiſhed by J. Bartolus in 1611. He firſt advanced, that the double refraction of Fletcher, with an intervening reflection, was ſufficient to produce the colours of the bow, and alſo to bring the rays that formed them to the eye of the ſpectator, without any ſubſequent reflection. He diſtinctly deſcribes the progreſs of a ray of light entering the upper part of the drop, where it ſuffers one refraction, and after being thereby thrown upon the back part of the inner ſurface, is from thence reflected to the lower part of the drop; at which place undergoing a ſecond refraction, it is thereby bent, ſo as to come directly to the eye. To verify this hypotheſis, this perſon (no philoſopher as he was) proceeded in a very ſenſible and philoſophical manner. For he procured a ſmall globe of ſolid glaſs, and viewing it when it was expoſed to the rays of the ſun, in the ſame manner in which he had ſuppoſed that the drops of rain were ſituated with reſpect to them, he actually obſerved the ſame colours which he had ſeen in the true rainbow, and in the ſame order.

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The diſcovery made by Antonio de Dominis, biſhop of Spalatro.

Thus the circumſtances in which the colours of the rainbow were formed, and the progreſs of a ray of light through a drop of water, were clearly underſtood; but philoſophers were a long time at a loſs when they endeavoured to aſſign reaſons for all the particular colours, and for the order of them. Indeed nothing but the doctrine of the different refrangibility of the rays of light, which was a diſcovery reſerved for the great Sir Iſaac Newton, could furniſh a complete ſolution of this difficulty. De Dominis ſuppoſed that the red rays were thoſe which had traverſed the leaſt ſpace in the inſide of a drop of water, and therefore retained more of their native force, and conſequently, ſtriking the eye more briſkly, gave it a ſtronger ſenſation; that the green and blue colours were produced by thoſe rays, the force of which had been, in ſome meaſure, obtunded in paſſing through a greater body of water; and that all the intermediate colours were compoſed (according to the hypotheſis which generally prevailed at that time) of a mixture of theſe three primary ones. That the different colours were cauſed by ſome difference in the impulſe of light upon the eye, and the greater or leſs impreſſion that was thereby made upon it, was an opinion which had been adopted by many perſons, who had ventured to depart from the authority of Ariſtotle.

Afterwards the ſame De Dominis obſerved, that all the rays of the ſame colour muſt leave the drop of water in a part ſimilarly ſituated with reſpect to the eye, in order that each of the colours may appear in a circle, the centre of which is a point of the heavens, in a line drawn from the ſun through the eye of the ſpectator. The red rays, he obſerved, muſt iſſue from the drop neareſt to the bottom of it, in order that the circle of red may be the outermoſt, and therefore the moſt elevated in the bow.

Notwithſtanding De Dominis conceived ſo juſtly of the manner in which the inner rainbow is formed, he was far from having as juſt an idea of the cauſe of the exterior bow. This he endeavoured to explain in the very ſame manner in which he had done the interior, viz. by one reflection of the light within the drop, preceded and followed by a refraction; ſuppoſing only that the rays which formed the exterior bow were returned to the eye by a part of the drop lower than that which tranſmitted the red of the interior bow. He alſo ſuppoſed that the rays which formed one of the bows came from the ſuperior part of the ſun's diſk, and thoſe which formed the other from the inferior part of it. He did not conſider, that upon thoſe principles, the two bows ought to have been contiguous; or rather, that an indefinite number of bows would have had their colours all intermixed; which would have been no bow at all.

When Sir Iſaac Newton diſcovered the different refrangibility of the rays of light, he immediately applied his new theory of light and colours to the phenomena of the rainbow, taking this remarkable object of philoſophical inquiry where De Dominis and Deſcartes, for want of this knowledge, were obliged to leave their inveſtigations imperfect. For they could give no good reaſon why the bow ſhould be coloured, and much leſs could they give any ſatisfactory account of the order in which the colours appear.

204 The true cauſe of the colours of the rainbow.

Plate CCCLX.

If different particles of light had not different degrees of refrangibility, on which the colours depend, the rainbow, beſides being much narrower than it is, would be colourleſs; but the different refrangibility of differently coloured rays being admitted, the reaſon is obvious, both why the bow ſhould be coloured, and alſo why the colours ſhould appear in the order in which they are obſerved. Let *a* (fig. 8.) be a drop of water, and S a pencil of light; which, on its leaving the drop of water, reaches the eye of the ſpectator. This ray, at its entrance into the drop, begins to be decompoſed into its proper colours; and upon leaving the drop, after one reflection and a ſecond refraction, it is farther decompoſed into as many ſmall differently-coloured pencils as there are primitive colours in the light. Three of them only are drawn in this figure, of which the blue is the moſt, and the red the leaſt, refracted.

The doctrine of the different refrangibility of light enables us to give a reaſon for the ſize of a bow of each particular colour. Newton, having found that the ſines of refraction of the moſt refrangible and leaſt refrangible rays, in paſſing from rain water into air, are in the proportion of 185 to 182, when the ſine of incidence is 138, calculated the ſize of the bow; and he found, that if the ſun was only a phyſical point, without ſenſible magnitude, the breadth of the inner bow would be 2 degrees; and if to this 30′ were added for the apparent diameter of the ſun, the whole breadth would be 2½ degrees. But as the outermoſt colours, eſpecially the violet, are extremely faint, the breadth of the bow will not in reality appear to exceed two degrees. He finds, by the ſame principles, that the breadth of the exterior bow, if it was everywhere equally vivid, would be 4° 20′. But in this caſe there is a greater deduction to be made, on account of the faintneſs of the light of the exterior bow; ſo that in fact, it will not appear to be more than 3 degrees broad.

The principal phenomena of the rainbow are all explained on Sir Iſaac Newton's principles in the following propoſitions.

When the rays of the ſun fall upon a drop of rain and enter into it, ſome of them, after one reflection and two refractions, may come to the eye of a ſpectator who has his back towards the ſun, and his face towards the drop.

205 Explanation of the phenomena of rainbow on the principles of Newton.

If XY (fig. 9.) is a drop of rain, and the ſun ſhines upon it in any lines *s f*, *s d*, *s a*, &c. moſt of the rays will enter into the drop; ſome few of them only will be reflected from the firſt ſurface; thoſe rays which are reflected from thence do not come under our preſent conſideration, becauſe they are never refracted at all. The greateſt part of the rays then enter the drop, and thoſe paſſing on to the ſecond ſurface, will moſt of them be tranſmitted through the drop; but neither do thoſe rays which are thus tranſmitted fall under our preſent conſideration, ſince they are not reflected. For the rays, which are deſcribed in the propoſition, are ſuch as are twice refracted and once reflected. However, at the ſecond ſurface, or hinder part of the drop, at *p g*, ſome few rays will be reflected, whilſt the reſt are tranſmitted; thoſe rays proceed in ſome ſuch lines as *n r*, *n q*: and coming out of the drop in the lines *r v*, *q t*, may fall upon the eye of a ſpectator, who is placed anywhere in thoſe lines, with his face towards the drop, and conſequently with his back towards the ſun, which is ſuppoſed to ſhine upon the drop in the lines *s f*, *s d*, *s a*, &c. Theſe rays are twice refracted and once reflected; they are refracted when they paſs out of the air into the drop; they are reflected from the ſecond ſurface, and are refracted again when they paſs out of the drop into the air.

When rays of light reflected from a drop of rain come to the eye, thoſe are called effectual which are able to excite a ſenſation.

When rays of light come out of a drop of rain, they will not be effectual, unleſs they are parallel and contiguous.

There are but few rays that can come to the eye at all: for ſince the greateſt part of thoſe rays which enter the drop XY (fig. 9.) between X and *a*, paſs out of the drop through the hinder ſurface *p g*; only few are reflected from thence, and come out through the nearer ſurface between *a* and *y*. Now, ſuch rays as emerge, or come out of the drop, between *a* and Y, will be ineffectual, unleſs they are parallel to one another, as *r v* and *q t* are; becauſe ſuch rays as come out diverging from one another will be ſo far aſunder when they come to the eye, that all of them cannot enter the pupil; and the very few that can enter it will not be ſufficient to excite any ſenſation. But even rays, which are parallel, as rv, qt, will not be effectual, unleſs there are ſeveral of them contiguous or very near to one another. The two rays rv and qt alone will not be perceived, though both of them enter the eye; for ſo very few rays are not ſufficient to excite a ſenſation.

When rays of light come out of a drop of rain after one reflection, thoſe will be effectual which are reflected from the ſame point, and which entered the drop near to one another.

Plate CCCLX.

Any rays, as sb and cd, (fig. 10.) when they have paſſed out of the air into a drop of water, will be refracted towards the perpendiculars bl, dl; and as the ray sb falls farther from the axis av than the ray cd, sb will be more refracted than cd; ſo that theſe rays, though parallel to one another at their incidence, may deſcribe the lines be and de after refraction, and be both of them reflected from one and the ſame point e. Now all rays, which are thus reflected from one and the ſame point, when they have deſcribed the lines ef, eg, and after reflection emerge at f and g, will be ſo refracted, when they paſs out of the drop into the air, as to deſcribe the lines fh, gi, parallel to one another. If theſe rays were to return from e in the lines eb, ed, and were to emerge at b and d, they would be refracted into the lines of their incidence bs, dc. But if theſe rays, inſtead of being returned in the lines eb, ed, are reflected from the ſame point e in the lines eg, ef, the lines of reflection eg and ef will be inclined both to one another and to the ſurface of the drop: juſt as much as the lines eb and ed are. Firſt, eb and eg make juſt the ſame angle with the ſurface of the drop: for the angle bex, which eb makes with the ſurface of the drop, is the complement of incidence, and the angle gev, which eg makes with the ſurface, is the complement of reflection; and theſe two are equal to one another. In the ſame manner we might prove, that ed and ef make equal angles with the ſurface of the drop. Secondly, The angle bed is equal to the angle feg; or the reflected rays eg, ef, and the incident rays be, de, are equally inclined to each other. For the angle of incidence bel is equal to the angle of reflection gel, and the angle of incidence del is equal to the angle of reflection fel; conſequently, the difference between the angles of incidence is equal to the difference between the angles of reflection, or $bel-del=gel-fel$, or $bed=gef$. Since therefore either the lines eg, ef, or the lines eb, ed, are equally inclined both to one another and to the ſurface of the drop; the rays will be refracted in the ſame manner, whether they were to return in the lines eb, ed, or are reflected in the lines eg, ef. But if they were to return in the lines eb, ed, the refraction, when they emerge at b and d would make them parallel. Therefore, if they are reflected from one and the ſame point e in the lines eg, ef, the refraction, when they emerge at g and f, will likewiſe make them parallel.

But though ſuch rays as are reflected from the ſame point in the hinder part of a drop of rain, are parallel to one another when they emerge, and ſo have one condition that is requiſite towards making them effectual, yet there is another condition neceſſary; for rays that are effectual, muſt be contiguous as well as parallel. And though rays, which enter the drop in different places, may be parallel when they emerge, thoſe only will be contiguous which enter it nearly at the ſame place.

Let XY (fig. 9.) be a drop of rain, ag the axis, or diameter of the drop, and sa a ray of light that comes from the ſun and enters the drop at the point a. This ray sa, becauſe it is perpendicular to both the ſurfaces, will paſs ſtraight through the drop in the line agh without being refracted; but any collateral rays, ſuch as thoſe that fall about sb, as they paſs through the drop, will be made to converge to their axis, and paſſing out at n will meet the axis at h: rays which fall farther from the axis than sb, ſuch as thoſe which fall about sc, will likewiſe be made to converge; but then their focus will be nearer to the drop than h. Suppoſe therefore i to be the focus to which the rays that fall about sc will converge, any ray sc, when it has deſcribed the line co within the drop, and is tending to the focus i, will paſs out of the drop at the point o. The rays that fall upon the drop about sd, more remote ſtill from the axis, will converge to a focus ſtill nearer than i, as ſuppoſe at k. Theſe rays therefore go out of the drop at p. The rays, that fall ſtill more remote from the axis, as se, will converge to a focus nearer than k, as ſuppoſe at l; and the ray se, when it has deſcribed the line eo within the drop, and is tending to l, will paſs out at the point o. The rays that fall ſtill more remote from the axis will converge to a focus ſtill nearer. Thus the ray sf will after refraction converge to a focus at m, which is nearer than l; and having deſcribed the line fn within the drop, it will paſs out to the point n. Now here we may obſerve, that as any rays sb or sc, fall farther above the axis sa, the points n, or o, where they paſs out behind the drop, will be farther above g; or that, as the incident ray riſes from the axis sa, the arc gno increaſes, till we come to ſome ray sd, which paſſes out of the drop at p; and this is the higheſt point where any ray that falls upon the quadrant or quarter ax can paſs out: for any rays se, or sf, that fall higher than sd, will not paſs out on any point above p, but at the points o, or n, which are below it. Conſequently, though the arc $gnop$ increaſes, whilſt the diſtance of the incident ray from the axis sa increaſes, till we come to the ray sd; yet afterwards, the higher the ray falls above the axis sa, this arc $pong$ will decreaſe.

We have hitherto ſpoken of the points on the hinder part of the drop, where the rays paſs out of it; but this was for the ſake of determining the points from whence thoſe rays are reflected, which do not paſs out behind the drop. For, in explaining the rainbow, we have no farther reaſon to conſider thoſe rays which go through the drop; ſince they can never come to the eye of a ſpectator placed anywhere in the lines rv or qt with his face towards the drop. Now, as there are many rays which paſs out of the drop between g and p, ſo ſome few rays will be reflected from thence: and conſequently the ſeveral points between g and p, which are the points where ſome of the rays paſs out of the drop, are likewiſe the points of reflection for the reſt which do not paſs out. Therefore, in reſpect of thoſe rays which are reflected we may call gp the arc of reflection; and may ſay, that this arc of reflection increaſes, as the diſtance of the incident ray from the axis *s a* increaſes, till we come to the ray *s d*; the arc of reflection is *g n* for the ray *s b*, it is *g o* for the ray *s c*, and *g p* for the ray *s d*. But after this, as the diſtance of the incident ray from the axis *s a* increaſes, the arc of reflection decreaſes; for *o g* leſs than *p g* is the arc of reflection for the ray *s e*, and *n g* is the arc of reflection for the ray *s f*.

From hence it is obvious, that ſome one ray, which falls above *s d*, may be reflected from the ſame point with ſome other ray which falls below *s d*. Thus, for inſtance, the ray *s b* will be reflected from the point *n*, and the ray *s f* will be reflected from the ſame point; and conſequently, when the reflected rays *n r*, *n q*, are refracted as they paſs out of the drop at *r* and *q*, they will be parallel, by what has been ſhown in the former part of this propoſition. But ſince the intermediate rays, which enter the drop between *s f* and *s b*, are not reflected from the ſame point *n*, theſe two rays alone will be the parallel to one another when they come out of the drop, and the intermediate rays will not be parallel to them. And conſequently theſe rays *r v*, *q t*, though they are parallel after they emerge at *r* and *q*, will not be contiguous, and for that reaſon will not be effectual; the ray *s d* is reflected from *p*, which has been ſhown to be the limit of the arc of reflection; ſuch rays as fall juſt above *s d*, and juſt below *s d*, will be reflected from nearly the ſame point *p*, as appears from what has been already ſhown. Theſe rays therefore will be parallel, becauſe they are reflected from the ſame point *p*; and they will likewiſe be contiguous, becauſe they all of them enter the drop at one and the ſame place very near to *d*. Conſequently, ſuch rays as enter the drop at *d*, and are reflected from *p* the limit of the arc of reflection, will be effectual; ſince, when they emerge at the fore part of the drop between *a* and *y*, they will be both parallel and contiguous.

If we can make out hereafter that the rainbow is produced by the rays of the ſun which are thus reflected from drops of rain as they fall whilſt the ſun ſhines upon them, this propoſition may ſerve to ſhow us, that this appearance is not produced by *any* rays that fall upon *any part*, and are reflected from any part of thoſe drops: ſince this appearance cannot be produced by any rays but thoſe which are effectual; and effectual rays muſt always enter each drop at one certain place in the fore part of it, and muſt likewiſe be reflected from one certain place in the hinder ſurface.

When rays that are effectual emerge from a drop of rain after one reflection and two refractions, thoſe which are moſt refrangible will, at their emerſion, make a leſs angle with the incident rays than thoſe do which are leaſt refrangible; and by this means the rays of different colours will be ſeparated from one another.

Plate CCCLX. Let *f h* and *g i* (fig. 10.) be effectual violet rays emerging from the drop at *f g*; and *f n*, *g p*, effectual red rays emerging from the ſame drop at the ſame place. Now, though all the violet rays are parallel to one another, becauſe they are ſuppoſed effectual, and though all the red rays are likewiſe parallel to one another for the ſame reaſon; yet the violet rays will not be parallel to the red rays. Theſe rays, as they have different colours, and different degrees of refrangibility, will diverge from one another; any violet ray *g i*, which emerges at *g*, will diverge from any red ray *g p*, which emerges at the ſame place. Now, both the violet ray *g i*, and the red ray *g p*, as they paſs out of the drop of water into the air, will be refracted from the perpendicular *l o*. But the violet ray is more refrangible than the red one; and for that reaſon *g i*, or the refracted violet ray, will make a greater angle with the perpendicular than *g p* the refracted red ray; or the angle *i g o* will be greater than the angle *p g o*. Suppoſe the incident ray *s b* to be continued in the direction *s k*, and the violet ray *i g* to be continued backward in the direction *i k*, till it meets the incident ray at *k*. Suppoſe likewiſe the red ray *p g* to be continued backwards in the ſame manner, till it meets the incident ray at *w*. The angle *i k s* is that which the violet ray, or moſt refrangible ray at its emerſion, makes with the incident ray; and the angle *p w s* is that which the red ray, or leaſt refrangible ray at its emerſion, makes with the incident ray. The angle *i k s* is leſs than the angle *p w s*. For, in the triangle, *g w k*, *g w s*, or *p w s*, is the external angle at the baſe, and *g k w* or *i k s* is one of the internal oppoſite angles; and either internal oppoſite angle is leſs than the external angle at the baſe. (Euc. B. I. Prop. 16.) What has been ſhown to be true of the rays *g i* and *g p* might be ſhown in the ſame manner of the rays *f h* and *f n*, or of any other rays that emerge reſpectively parallel to *g i* and *g p*. But all the effectual violet rays are parallel to *g i*, and all the effectual red rays are parallel to *g p*. Therefore the effectual violet rays at their emerſion make a leſs angle with the incident ones than the effectual red ones. And for the ſame reaſon, in all the other ſorts of rays, thoſe which are moſt refrangible, at their emerſion from a drop of rain after one reflection, will make a leſs angle with the incident rays, than thoſe do which are leſs refrangible.

Or otherwiſe: When the rays *g i* and *g p* emerge at the ſame point *g*, as they both come out of water into air, and conſequently are refracted from the perpendicular, inſtead of going ſtraight forwards in the line *e g* continued, they will both be turned round upon the point *g* from the perpendicular *g o*. Now it is eaſy to conceive, that either of theſe lines might be turned in this manner upon the point *g* as upon a centre, till they became parallel to *s b* the incident ray. But if either of theſe lines or rays were refracted ſo much from *g o* as to become parallel to *s b*, the ray ſo much refracted, would, after emerſion, make no angle with *s k*, becauſe it would be parallel to it. And conſequently that ray which is moſt turned round upon the point *g*, or that ray which is moſt refrangible, will after emerſion be neareſt parallel to the incident ray, or will make the leaſt angle with it. The ſame may be proved of all other rays emerging parallel to *g i* and *g p* reſpectively, or of all effectual rays; thoſe which are moſt refrangible will after emerſion make a leſs angle with the incident rays, than thoſe do which are leaſt refrangible.

But ſince the effectual rays of different colours make different angles with *s k* at their emerſion, they will be ſeparated from one another: ſo that if the eye was placed in the beam *f g h i*, it would receive only rays of one colour from the drop *x a g v*; and if it was placed in the beam $fgnp$, it would receive only rays of ſome other colour.

The angle swp, which the leaſt refrangible or red rays make with the incident ones when they emerge ſo as to be effectual, is found by calculation to be 42 degrees 2 minutes. And the angle ski, which the moſt refrangible rays make with the incident ones when they emerge ſo as to be effectual, is found to be 40 degrees 17 minutes. The rays which have the intermediate degrees of refrangibility, make with the incident ones intermediate angles between 42 degrees 2 minutes, and 40 degrees 17 minutes.

If a line is ſuppoſed to be drawn from the centre of the ſun through the eye of the ſpectator, the angle which any effectual ray, after two refractions and one reflection, makes with the incident ray, will be equal to the angle which it makes with that line.

Plate CCCLX.

Let the eye of the ſpectator be at i, (fig. 10.) and let gt be the line ſuppoſed to be drawn from the centre of the ſun through the eye of the ſpectator; the angle git, which any effectual ray makes with this line, will be equal to the angle iks, which the ſame ray makes with the incident ray sb or sk. If sb is a ray coming from the centre of the ſun, then ſince gt is ſuppoſed to be drawn from the ſame point, theſe two lines, upon account of the remoteneſs of the point from whence they are drawn, may be looked upon as parallel to one another. But the right line ki croſſing theſe two parallel lines will make the alternate angles equal. (Euc. B. I. Prop. 29.) Therefore kit or git is equal to ski.

When the ſun ſhines upon the drops of rain as they are falling, the rays that come from thoſe drops to the eye of a ſpectator, after one reflection and two refractions, produce the primary rainbow.

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Two rainbows ſeen at once.

If the ſun ſhines upon the rain as it falls, there are commonly ſeen two bows, as AFB, CHD, (fig. 11.); or if the cloud and rain does not reach over that whole ſide of the ſky where the bows appear, then only a part of one or of both bows is ſeen in that place where the rain falls. Of theſe two bows, the innermoſt AFB is the more vivid of the two, and this is called the *primary bow*. The outer part TFY of the primary bow is red, the inner part VEX is violet; the intermediate parts, reckoning from the red to the violet, are orange, yellow, green, blue, and indigo. Suppoſe the ſpectator's eye to be at O, and let LOP be an imaginary line drawn from the centre of the ſun through the eye of the ſpectator: if a beam of light S coming from the ſun falls upon any drop F; and the rays that emerge at F in the line FO, ſo as to be effectual, make an angle FOP of 42° 2′ with the line LP; then theſe effectual rays make an angle of 42° 2′ with the incident rays, by the preceding propoſition, and conſequently theſe rays will be red, ſo that the drop F will appear red. All the other rays, which emerge at F, and would be effectual if they fell upon the eye, are refracted more than the red ones, and conſequently will paſs above the eye. If a beam of light S falls upon the drop E; and the rays that emerge at E in the line EO, ſo as to be effectual, make an angle EOP of 40° 17′ with the line LP; then theſe effectual rays make likewiſe an angle of 40° 17′ with the incident rays, and the drop E will appear of a violet colour. All the other rays, which emerge at E, and would be effectual if they came to the eye, are refracted leſs than the violet ones, and therefore paſs below the eye. The intermediate drops between F and E will for the ſame reaſons be of the intermediate colours.

Thus we have ſhown why a ſet of drops from F to E, as they are falling, ſhould appear of the primary colours, red, orange, yellow, green, blue, indigo, and violet. It is not neceſſary that the ſeveral drops, which produce theſe colours, ſhould all of them fall at exactly the ſame diſtance from the eye. The angle FOP, for inſtance, is the ſame whether the diſtance of the drop from the eye is OF, or whether it is in any other part of the line OF ſomething nearer to the eye. And whilſt the angle FOP is the ſame, the angle made by the emerging and incident rays, and conſequently the colour of the drop, will be the ſame. This is equally true of any other drop. So that although in the figure the drops F and E are repreſented as falling perpendicularly one under the other, yet this is not neceſſary in order to produce the bow.

But the coloured line FE, which we have already accounted for, is only the breadth of the bow. It ſtill remains to be ſhown, why not only the drop F ſhould appear red, but why all the other drops quite from A to B in the arc ATFYB ſhould appear of the ſame colour. Now it is evident, that wherever a drop of rain is placed, if the angle which the effectual rays make with the line LP is equal to the angle FOP, that is, if the angle which the effectual rays make with the incident rays is 42° 2′, any of thoſe drops will be red, for the ſame reaſon that the drop F is of this colour.

If FOP was to turn round upon the line OP, ſo that one end of this line ſhould always be at the eye, and the other be at P oppoſite to the ſun; ſuch a motion of this figure would be like that of a pair of compaſſes turning round upon one of the legs OP with the opening FOP. In this revolution the drop F would deſcribe a circle, P would be the centre, and ATFYB would be an arc in this circle. Now ſince, in this motion of the line and drop OF, the angle made by FO with OP, that is the angle FOP, continues the ſame; if the ſun was to ſhine upon this drop as it revolves, the effectual rays would make the ſame angle with the incident rays, in whatever part of the arc ATFYB the drop was to be. Therefore, whether the drop is at A, or at T, or at Y, or at B, or wherever elſe it is in this whole arc, it would appear red, as it does at F.—The drops of rain, as they fall, are not indeed turned round in this manner: but then, as innumerable of them are falling at once in right lines from the cloud, whilſt one drop is at F, there will be others at Y, at T, at B, at A, and in every other part of the arc ATFYB: and all theſe drops will be red for the ſame reaſon that the drop F would have been red, if it had been in the ſame place. Therefore, when the ſun ſhines upon the rain as it falls, there will be a red arc ATFYB oppoſite to the ſun. In the ſame manner, becauſe the drop E is violet, we might prove that any other drop, which, whilſt it is falling, is in any part of the arc AVEXB, will be violet; and conſequently, at the ſame time that the red arc ATFYB appears, there will likewiſe be a violet arc AVEXB below or within it. FE is the diſtance between theſe two coloured arcs; and from what has been ſaid, it follows, that the intermediate ſpace between theſe two arcs will be filled up with arcs of the intermediate colours, orange, yellow, blue, green, and indigo. All theſe coloured arcs together make up the primary rainbow.

The primary rainbow is never a greater arc than a ſemicircle.

Plate CCCLX.

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Why the arc of the primary rainbow is never greater than a ſemicircle.

Since the line LOP is drawn from the ſun through the eye of the ſpectator, and ſince P (fig. 9.) is the centre of the rainbow; it follows, that the centre of the rainbow is always oppoſite to the ſun. The angle FOP is an angle of 42° 2′, as was obſerved, or F the higheſt part of the bow is 42° 2′ from P the centre of it. If the ſun is more than 42° 2′ high, P the centre of the rainbow, which is oppoſite to the ſun, will be more than 42° 2′ below the horizon; and conſequently F the top of the bow, which is only 42° 2′ from P, will be below the horizon; that is, when the ſun is more than 42° 2′ high, no primary rainbow will be ſeen. If the ſun is ſomething leſs than 42° 2′ high, then P will be ſomething leſs than 42° 2′ below the horizon; and conſequently F, which is only 42° 2′ from P, will be juſt above the horizon; that is, a ſmall part of the bow at this height of the ſun will appear cloſe to the ground oppoſite to the ſun. If the ſun is 20° high, then P will be 20° below the horizon; and F the top of the bow, being 42° 2′ from P, will be 22° 2′ above the horizon; therefore, at this height of the ſun, the bow will be an arc of a circle whoſe centre is below the horizon; and conſequently that arc of the circle which is above the horizon, or [illegible] bow, will be leſs than a ſemicircle. If the ſun is in the horizon, then P, the centre of the bow, will be in the oppoſite part of the horizon; F, the top of the bow, will be 42° 2′ above the horizon; and the bow itſelf, becauſe the horizon paſſes through the centre of it, will be a ſemicircle. More than a ſemicircle can never appear; becauſe if the bow was more than a ſemicircle, P the centre of it muſt be above the horizon; but P is always oppoſite to the ſun, therefore P cannot be above the horizon, unleſs the ſun is below it; and when the ſun is ſet, or is below the horizon, it cannot ſhine upon the drops of rain as they fall; and conſequently, when the ſun is below the horizon, no bow at all can be ſeen.

When the rays of the ſun fall upon a drop of rain, ſome of them, after two reflections and two refractions, may come to the eye of a ſpectator, who has his back towards the ſun and his face towards the drop.

If HGW (fig. 12.) is a drop of rain, and parallel rays coming from the ſun, as zv, yw, fall upon the lower part of it, they will be refracted towards the perpendiculars vl, wl, as they enter into it, and will deſcribe ſome ſuch lines as vh, wi. At h and i great part of theſe rays will paſs out of the drop; but ſome of them will be reflected from thence in the lines hf, ig. At f and g again, great part of the rays that were reflected thither will paſs out of the drop. But theſe rays will not come to the eye of a ſpectator at o. However, here again all the rays will not paſs out; but ſome few will be reflected from f and g, in ſome ſuch lines as fd, gb; and theſe, when they emerge out of the drop of water into the air at b and d, will be refracted from the perpendiculars, and, deſcribing the lines dt, bo, may come to the eye of the ſpectator who has his back towards the ſun and his face towards the drop.

Theſe rays, which are parallel to one another after they have been once refracted and once reflected in a drop of rain, will be effectual when they emerge after two refractions and two reflections.

No rays can be effectual, unleſs they are contiguous and parallel. From what was ſaid, it appears, that when rays come out of a drop of rain contiguous to one another, either after one or after two reflections, they muſt enter the drop nearly at one and the ſame place. And if ſuch rays as are contiguous are parallel after the firſt reflection, they will emerge parallel, and therefore will be effectual. Let zv and yw be contiguous rays which come from the ſun, and are parallel to one another when they fall upon the lower part of the drop, ſuppoſe theſe rays to be refracted at v and w, and to be reflected at b and i; if they are parallel to one another, as bf, gi, after this firſt reflection, then, after they are reflected a ſecond time from f and g, and refracted a ſecond time as they emerge at d and b, they will go out of the drop parallel to one another in the lines dt and bo, and will therefore be effectual.

The rays zv, yw, are refracted towards the perpendiculars vl, wl, when they enter the drop, and will be made to converge. As theſe rays are very oblique, their focus will not be far from the ſurface vw. If this focus is at k, the rays, after they have paſſed the focus, will diverge from thence in the directions kb, ki; and if ki is the principal focal diſtance of the concave reflecting ſurface bi, the reflected rays bf, ig, will be parallel. Theſe rays ef, ig, are reflected again from the concave ſurface fg, and will meet in a focus at e, ſo that ge will be the principal focal diſtance of this reflecting ſurface fg. And becauſe bi and fg are parts of the ſame ſphere, the principal focal diſtances ge and ki will be equal to one another. When the rays have paſſed the focus e, they will diverge from thence in the lines ed, eb: and we are to ſhow, that when they emerge at d and b, and are refracted there, they will become parallel.

Now if the rays vk, wk, when they have met at k, were to be turned back again in the directions kv, kw, and were to emerge at v and w, they would be refracted into the lines of their incidence, vz, wy, and therefore would be parallel. But ſince ge is equal to ik, as has already been ſhown, the rays ed, eb, that diverge from e, fall in the ſame manner upon the drop at d and b, as the rays kv, kw, would fall upon it at v and w; and ed, eb, are juſt as much inclined to the refracting ſurface db, as kv, kw, would be to the ſurface vw. From hence it follows, that the rays ed, eb, emerging at d and b, will be refracted in the ſame manner, and will have the ſame direction in reſpect of one another, as kv, kw, would have. But kv and kw would be parallel after refraction. Therefore ed and eb will emerge in lines dp, bo, ſo as to be parallel to one another, and conſequently ſo as to be effectual.

When rays that are effectual emerge from a drop of rain after two reflections and two refractions, thoſe which are moſt refrangible will at their emerſion make a greater angle with the incident rays than thoſe do which are leaſt refrangible; and by this means the rays of different colours will be ſeparated from one another.

Plate CCCLX.

If rays of different colours, which are differently refrangible, emerge at any point *b* (fig. 12.), theſe rays will not be all of them equally refracted from the perpendicular. Thus, if *b o* is a red ray, which is of all others the leaſt refrangible, and *b m* is a violet ray, which is of all others the moſt refrangible; when theſe two rays emerge at *b*, the violet ray will be refracted more from the perpendicular *b x* than the red ray, and the refracted angle *x b m* will be greater than the refracted angle *x b o*. From hence it follows, that theſe two rays, after emerſion, will diverge from one another. In like manner, the rays that emerge at *d* will diverge from one another; a red ray will emerge in the line *d p*, a violet ray in the line *d t*. So that though all the effectual red rays of the beam *b d m t* are parallel to one another, and all the effectual red rays of the beam *b d o p* are likewiſe parallel to one another, yet the violet rays will not be parallel to the red ones, but the violet beam will diverge from the red beam. Thus the rays of different colours will be ſeparated from one another.

This will appear farther, if we conſider what the propoſition affirms, That any violet or moſt refrangible ray will make a greater angle with the incident rays, than any red or leaſt refrangible ray makes with the ſame incident rays. Thus if *y w* is an incident ray, *b m* a violet ray emerging from the point *b*, and *b o* a red ray emerging from the ſame point; the angle which the violet ray makes with the incident one is *y r m*, and that which the red ray makes with it is *y s o*. Now *y r m* is a greater angle than *y s o*. For in the triangle *b r s* the internal angle *b r s* is leſs than *b s y* the external angle at the baſe. (Eucl. B. I. Prop. 16.) But *y r m* is the complement of *b r s* or of *b r y* to two right ones, and *y s o* is the complement of *b s y* to two right ones. Therefore, ſince *b r y* is leſs than *b s y*, the complement of *b r y* to two right angles will be greater than the complement of *b s y* to two right angles; or *y r m* will be greater than *y s o*.

Or otherwiſe: Both the rays *b o* and *b m*, when they are refracted in paſſing out of the drop at *b*, are turned round upon the point *b* from the perpendicular *b x*. Now either of theſe lines *b o* or *b m* might be turned round in this manner, till it made a right angle with *y w*. Conſequently, that ray which is moſt turned round upon *b*, or which is moſt refracted, will make an angle with *y w*, that will be nearer to a right one than that ray makes with it which is leaſt rurned round upon *b*, or which is leaſt refracted. Therefore that ray which is moſt refracted will make a greater angle with the incident ray than that which is leaſt refracted.

But ſince the emerging rays, as they are differently refrangible, make different angles with the ſame incident ray *y w*, the refraction which they ſuffer at emerſion will ſeparate them from one another.

The angle *y r m*, which the moſt refrangible or violet rays make with the incident ones, is found by calculation to be 54° 7′; and the angle *y s o*, which the leaſt refrangible or red rays make with the incident ones, is found to be 50° 57′: the angles, which the rays of the intermediate colours, indigo, blue, green, yellow, and orange, make with the incident rays, are intermediate angles between 54° 7′ and 50° 57′.

If a line is ſuppoſed to be drawn from the centre of the ſun through the eye of the ſpectator; the angle which, after two refractions and two reflections, any effectual ray makes with the incident ray, will be equal to the angle which it makes with that line.

If *y w* (fig. 12.) is an incident ray, *b o* an effectual ray, and *q n* a line drawn from the centre of the ſun though *o* the eye of the ſpectator; the angle *y s o*, which the effectual ray makes with the incident ray, is equal to *s o n* the angle which the ſame effectual ray makes with the line *q n*. For *y w* and *q n*, conſidered as drawn from the centre of the ſun, are parallel; *b o* croſſes them, and conſequently makes the alternate angles *y s o*, *s o n*, equal to one another. Eucl. B. I Prop. 29.

When the ſun ſhines upon the drops of rain as they are falling, the rays that come from theſe drops to the eye of a ſpectator, after two reflections and two refractions, produce the ſecondary rainbow.

208 The ſecondary rainbow produced by two reflections and two refractions.

The ſecondary rainbow is the outermoſt, CHD, fig. 11. When the ſun ſhines upon a drop of rain H; and the rays HO, which emerge at H ſo as to be effectual, make an angle HOP of 54° 7′ with LOP a line drawn from the ſun through the eye of the ſpectator; the ſame effectual rays will make likewiſe an angle of 54° 7′ with the incident rays S, and the rays which emerge at this angle are violet ones, by what was obſerved above. Therefore, if the ſpectator's eye is at O, none but violet rays will enter it: for as all the other rays make a leſs angle with OP, they will fall above the ſpectator's eye. In like manner, if the effectual rays that emerge from the drop G make an angle of 50° 57′ with the line OP, they will likewiſe make the ſame angle with the incident rays S; and conſequently, from the drop G to the ſpectator's eye at O, no rays will come but red ones; for all the other rays making a greater angle with the line OP, will fall below the eye at O. For the ſame reaſon, the rays emerging from the intermediate drops between H and G, and coming to the ſpectator's eye at O, will emerge at intermediate angles, and therefore will have the intermediate colours. Thus if there are ſeven drops from H to G incluſively, their colours will be violet, indigo, blue, green, yellow, orange, and red. This coloured line is the breadth of the ſecondary rainbow.

Now, if HOP was to turn round upon the line OP, like a pair of compaſſes upon one of the legs OP with the opening HOP, it is plain from the ſuppoſition, that, in ſuch a revolution of the drop H, the angle HOP would be the ſame, and conſequently the emerging rays would make the ſame angle with the incident ones. But in ſuch a revolution the drop would deſcribe a circle of which P would be the centre, and CNHRD an arc. Conſequently, ſince, when the drop is at N, or at R, or anywhere elſe in that arc, the emerging rays make the ſame angle with the incident ones as when the drop is at H, the colour of the drop

Of the Rainbow.

will be the ſame to an eye placed at O, whether the drop is at N, or at H, or at R, or anywhere elſe in that arc. Now though the drop does not thus turn round as it falls, and does not paſs through the ſeveral parts of this arc, yet, ſince there are drops of rain falling everywhere at the ſame time, when one drop is at H, there will be another at R, another at N, and others in all parts of the arc; and theſe drops will all of them be violet-coloured, for the ſame reaſon that the drop H would have been of this colour if it had been in any of thoſe places. In like manner, as the drop G is red when it is at G, it would likewiſe be red in any part of the arc CWGQD; and ſo will any other drop when, as it is falling, it comes to any part of that arc. Thus as the ſun ſhines upon the rain, whilſt it falls, there will be two arcs produced, a violet-coloured one CNHRD, and a red one CWGQD; and for the ſame reaſons the intermediate ſpace between theſe two arcs will be filled up with arcs of the intermediate colours. All theſe arcs together make up the ſecondary rainbow.

The colours of the ſecondary rainbow are fainter than thoſe of the primary rainbow; and are ranged in the contrary order.

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Why the colours of the ſecondary rainbow are fainter than thoſe of the primary, and ranged in a contrary order.

The primary rainbow is produced by ſuch rays as have been only once reflected; the ſecondary rainbow is produced by ſuch rays as have been twice reflected. But at every reflection ſome rays paſs out of the drop of rain without being reflected; ſo that the oftener the rays are reflected, the fewer of them are left. Therefore the colours of the ſecondary bow are produced by fewer rays, and conſequently will be fainter, than the colours of the primary bow.

In the primary bow, reckoning from the outſide of it, the colours are ranged in this order; red, orange, yellow, green, blue, indigo, violet. In the ſecondary bow, reckoning from the outſide, the colours are violet, indigo, blue, green, yellow, orange, red. So that the the red, which is the outermoſt or higheſt colour in the primary bow, is the innermoſt or loweſt colour in the ſecondary one.

Plate CCCLX.

Now the violet rays, when they emerge ſo as to be effectual after one reflection, make a leſs angle with the incident rays than the red ones; conſequently the violet rays make a leſs angle with the lines OP (fig. 11.) than the red ones. But, in the primary rainbow, the rays are only once reflected, and the angle which the effectual rays make with OP is the diſtance of the coloured drop from P the centre of the bow. Therefore the violet drops, or violet arc, in the primary bow, will be nearer to the centre of the bow than the red drops or red arc; that is, the innermoſt colour in the primary bow will be violet, and the outermoſt colour will be red. And, for the ſame reaſon, through the whole primary bow, every colour will be nearer to the centre P, as the rays of that colour are more refrangible.

But the violet rays, when they emerge ſo as to be effectual after two reflections, make a greater angle with the incident rays than the red ones; conſequently the violet rays will make a greater angle with the line OP, than the red ones. But in the ſecondary rainbow the rays are twice reflected, and the angle which effectual rays make with OP is the diſtance of the coloured drop from P the centre of the bow. Therefore the violet drops or violet arc in the ſecondary bow will be farther from the centre of the bow, than the red drops or red arc; that is, the outermoſt colour in the ſecondary bow will be violet, and the innermoſt colour will be red. And, for the ſame reaſon, through the whole ſecondary bow, every colour will be further from the centre P, as the rays of that colour are more refrangible.

The apparent place &c. of objects.

§ 2. *Of Coronas, Parhelia, &c.*

Under the articles CORONA and PARHELION, a pretty full account is given of the different hypotheſes concerning theſe phenomena, and likewiſe of the method by which theſe hypotheſes are ſupported, from the known laws of refraction and reflection; to which therefore, in order to avoid repetition, we muſt refer.

§ 3. *Of the apparent Place, Diſtance, Magnitude, and Motion of Objects.*

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Dr Barrow's theory reſpecting the apparent place of objects.

Philoſophers in general had taken for granted, that the place to which the eye refers any viſible object ſeen by reflection or refraction, is that in which the viſual ray meets a perpendicular from the object upon the reflecting or refracting plane. But this method of judging of the place of objects was called in queſtion by Dr Barrow, who contended that the arguments brought in favour of the opinion were not concluſive. Theſe arguments are, that the images of objects appear ſtraight in a plane mirror, but curved in a convex or concave one: that a ſtraight thread, when partly immerſed perpendicularly in water, does not appear crooked as when it is obliquely plunged into the fluid; but that which is within the water ſeems to be a continuation of that which is without. With reſpect to the reflected image, however, of a perpendicular right line from a convex or concave mirror, he ſays, that it is not eaſy for the eye to diſtinguiſh the curve that it really makes; and that, if the appearance of a perpendicular thread, part of which is plunged in water, be cloſely attended to, it will not favour the common hypotheſis. If the thread is of any ſhining metal, as ſilver, and viewed obliquely, the image of the part immerſed will appear to detach itſelf ſenſibly from that part which is without the water, ſo that it cannot be true that every object appears to be in the ſame place where the refracted ray meets the perpendicular; and the ſame obſervation, he thinks, may be extended to the caſe of reflection. According to this writer, we refer every point of an object to the place from which the pencils of light, that give us the image of it, iſſue, or from which they would have iſſued if no reflecting or refracting ſubſtance intervened. Purſuing this principle, he proceeds to inveſtigate the place in which the rays iſſuing from each of the points of an object, and which reach the eye after one reflection or refraction, meet; and he found, that the refracting ſurface was plane, and the refraction was made from a denſer medium into a rarer, thoſe rays would always meet in a place between the eye and a perpendicular to the point of incidence. If a convex miror be uſed, the caſe will be the ſame; but if the mirror be plane, the rays will meet in the perpendicular, and beyond it if it be concave.

The apparent place, &c. of objects.

cave. He alſo determined, according to theſe principles, what form the image of a right line will take, when it is preſented in different manners to a ſpherical mirror, or when it is ſeen through a refracting medium.

Probable as Dr Barrow thought the maxim which he endeavoured to eſtabliſh, concerning the ſuppoſed place of viſible objects, he has the candour to mention an objection to it, and to acknowledge that he was not able to give a ſatisfactory ſolution of it. It is this. Let an object be placed beyond the focus of a convex lens; and if the eye be cloſe to the lens, it will appear confuſed, but very near to is true place. If the eye be a little withdrawn, the confuſion will increaſe, and the object will ſeem to come nearer; and when the eye is near the focus, the confuſion will be exceedingly great, and the object will ſeem to be cloſe to the eye. But in this experiment the eye receives no rays but thoſe that are converging: and the point from which they iſſue is ſo far from being nearer than the object, that it is beyond it; notwithſtanding which, the object is conceived to be much nearer than it is, though no very diſtinct idea can be formed of its preciſe diſtance. It may be obſerved, that in reality, the rays falling upon the eye in this caſe in a manner quite different from that in which they fall upon it in other circumſtances, we can form no judgment about the place from which they iſſue. This ſubject was afterwards taken up by Berkeley, Smith, Montucla, and others.

211 M. de la Hire's obſervations

M. de la Hire made ſeveral valuable obſervations concerning the diſtance of viſible objects, and various other phenomena of viſion, which are well worth our notice. He alſo took particular pains to aſcertain the manner in which the eye conforms itſelf to the view of objects placed at different diſtances. He enumerates five circumſtances, which aſſiſt us in judging of the diſtance of objects, namely their apparent magnitude, the ſtrength of the colouring, the direction of the two eyes, the parallax of the objects, and the diſtinctneſs of their ſmall parts. Painters, he ſays, can only take advantage of the two firſt-mentioned circumſtances, and therefore pictures can never perfectly deceive the eye; but in the decorations of theatres, they, in ſome meaſure, make uſe of them all. The ſize of objects, and the ſtrength of their colouring, are diminiſhed in proportion to the diſtance at which they are intended to appear. Parts of the ſame object which are to appear at different diſtances, as columns in an order of architecture, are drawn upon different planes, a little removed from one another, that the two eyes may be obliged to change their direction, in order to diſtinguiſh the parts of the nearer plane from thoſe of the more remote. The ſmall diſtance of the planes ſerves to make a ſmall parallax, by changing the poſition of the eye; and as we do not preſerve a diſtinct idea of the quantity of parallax, correſponding to the different diſtances of objects, it is ſufficient that we perceive there is a parallax, to be convinced that theſe planes are diſtant from one another, without determining what that diſtance is; and as to the laſt circumſtance, viz. the diſtinctneſs of the ſmall parts of objects, it is of no uſe in diſcovering the deception, on account of the falſe light that is thrown upon theſe decorations.

To theſe obſervations concerning deceptions of ſight, we ſhall add a ſimilar one of M. le Cat, who took notice that the reaſon why we imagine objects to be larger when they are ſeen through a miſt, is the dimneſs or obſcurity with which they are then ſeen; this circumſtance being aſſociated with the idea of great diſtance. This, he ſays, is confirmed by our being ſurpriſed to find, upon approaching ſuch objects, that they are ſo much nearer to us, as well as ſo much ſmaller, than we had imagined.

The apparent place, &c. of objects.

212 M. le Cat's account of the largeneſs of objects in miſt.

Among other caſes concerning viſion, which fell under the conſideration of M. de la Hire, he mentions one which is of difficult ſolution. It is when a candle, in a dark place, and ſituated beyond the limits of diſtinct viſion, is viewed through a very narrow chink in a card; in which caſe a conſiderable number of candles, ſometimes ſo many as ſix, will be ſeen along the chink. This appearance he aſcribes to ſmall irregularities in the ſurface of the humours of the eye, the effect of which is not ſenſible when rays are admitted into the eye through the whole extent of the pupil, and conſequently one principal image effaces a number of ſmall ones; whereas, in this caſe, each of them is formed ſeparately, and no one of them is ſo conſiderable as to prevent the others from being perceived at the ſame time.

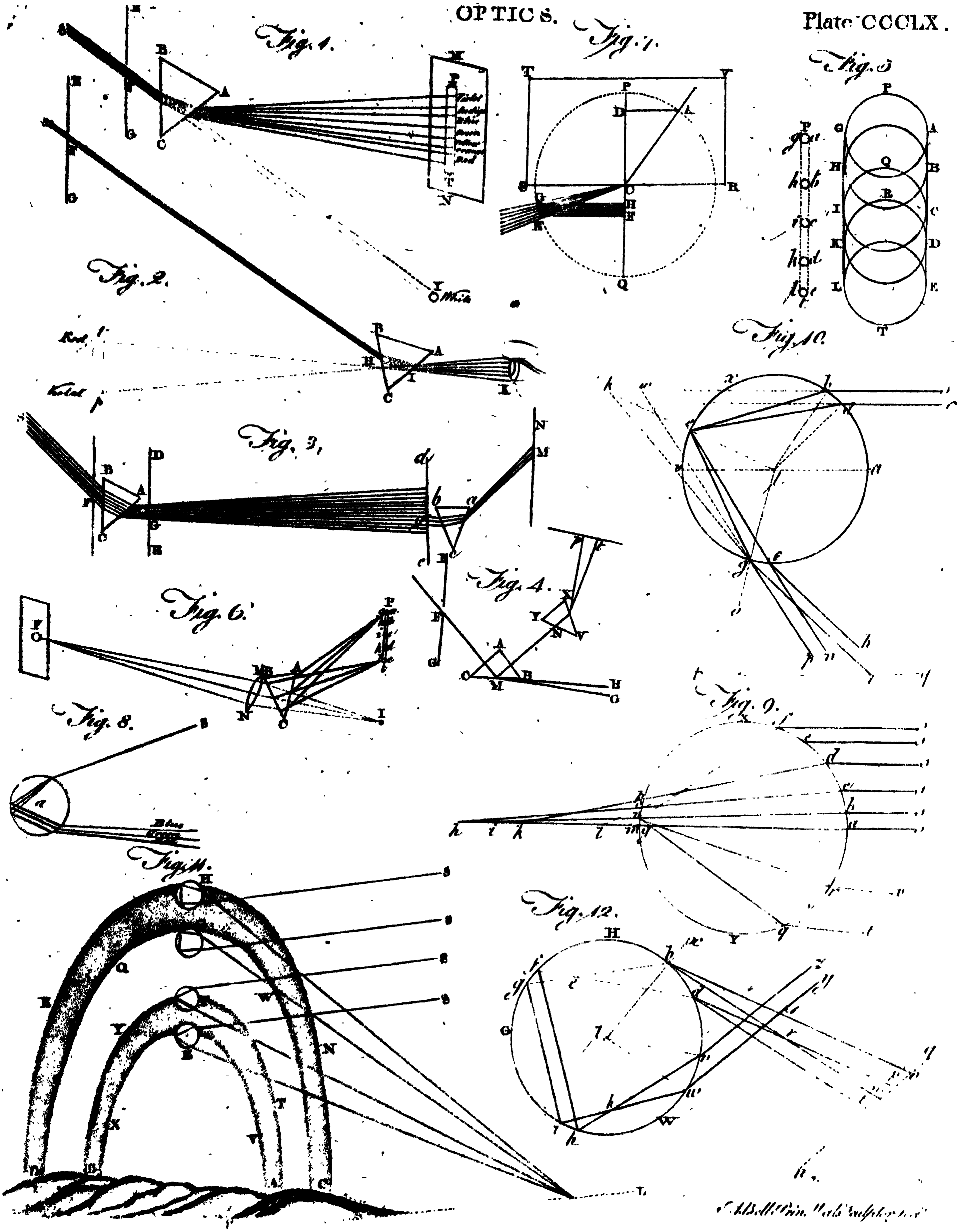
There are few perſons, M. de la Hire obſerves, who have both their eyes perfectly equal, not only with reſpect to the limits of diſtinct viſion, but alſo with reſpect to the colour with which objects appear tinged when they are viewed by them, eſpecially if one of the eyes has been expoſed to the impreſſion of a ſtrong light. To compare them together in this reſpect, he directs us to take two thin cards, and to make in each of them a round hole of a third or a fourth of a line in diameter, and, applying one of them to each of the eyes, to look through the holes on a white paper, equally illuminated, when a circle of the paper will appear to each of the eyes, and, placing the cards properly, theſe two circles may be made to touch one another, and thereby the appearance of the ſame object to each of the eyes may be compared to the greateſt advantage. To make this experiment with the greateſt exactneſs, it is neceſſary, he ſays, that the eyes be kept ſhut ſome time before the cards be applied to them.

M. de la Hire firſt endeavoured to explain the cauſe of thoſe dark ſpots which ſeem to float before the eyes, eſpecially thoſe of old people. They are moſt viſible when the eyes are turned towards an uniform white object, as the ſnow in the open fields. If they be fixed when the eye is ſo, this philoſopher ſuppoſed that they were occaſioned by extravaſated blood upon the retina. But he thought that the moveable ſpots were occaſioned by opaque matter floating in the aqueous humour of the eye. He thought the vitreous humour was not ſufficiently limpid for this purpoſe.

By the following calculation, M. de la Hire gives us an idea of the extreme ſenſibility of the optic nerves. One may ſee very eaſily, at the diſtance of 4000 toiſes, the ſail of a wind mill, 6 feet in diameter; and the eye being ſuppoſed to be an inch in diameter, the picture of this ſail, at the bottom of the eye, will be $\frac{1}{8000}$ of an inch, which is leſs than the 666th part of a line, and is about the 66th part of a common hair, or the 8th part of a ſingle thread of ſilk. So ſmall, therefore, muſt one of the fibres of the optic nerve be, which he ſays

OPTICS.

Plate CCCLX.



A. Bell Prin. Wal. Sculptor fecit

ſays is almoſt inconceivable, ſince each of theſe fibres is a tube that contains ſpirits. If birds perceive diſtant objects as well as men, which he thinks very probable, he obſerves that the fibres of their optic nerves muſt be much finer than ours.

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Berkeley's account of the judgement formed concerning diſtance by confuſed viſion.

The perſon who firſt took much notice of Dr Barrow's hypotheſis was the ingenious Dr Berkeley, biſhop of Cloyne, who diſtinguiſhed himſelf ſo much by the objections which he ſtarted to the reality of a material world, and by his oppoſition to the Newtonian doctrine of fluxions. In his Eſſay towards a new Theory of Viſion, he obſerves, that the circle formed upon the retina, by the rays which do not come to a focus, produce the ſame confuſion in the eye, whether they croſs one another before they reach the retina, or tend to do it afterwards: and therefore that the judgment concerning diſtance will be the ſame in both the caſes, without any regard to the place from which the rays originally iſſued; ſo that in this caſe, as, by receding from the lens, the confuſion, which always accompanies the nearneſs of an object, increaſes, the mind will judge that the object comes nearer.

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Smith's account.

But, ſays Dr Smith, if this be true, the object ought always to appear at a leſs diſtance from the eye than that at which objects are ſeen diſtinctly, which is not the caſe: and to explain this appearance, as well as every other in which a judgment is formed concerning diſtance, he maintains, that we judge of it by the apparent magnitude of objects only, or chiefly; ſo that, ſince the image grows larger as we recede from the lens through which it is viewed, we conceive the object to come nearer. He alſo endeavours to ſhow, that, in all caſes in which glaſſes are uſed, we judge of diſtance by the ſame ſimple rule; from which he concludes univerſally, that the apparent diſtance of an object ſeen in a glaſs is to its apparent diſtance ſeen by the naked eye, as the apparent magnitude to the naked eye is to its apparent magnitude in the glaſs.

215
Objected to by Mr Robins.

But that we do not judge of diſtance merely by the angle under which objects are ſeen, is an obſervation as old as Alhazen, who mentions ſeveral inſtances, in which, though the angles under which objects appear to be different, the magnitudes are univerſally and inſtantaneouſly deemed not to be ſo. And Mr Robins clearly ſhows the hypotheſis of Dr Smith to be contrary to fact in the moſt common and ſimple caſes. In microſcopes, he ſays, it is impoſſible that the eye ſhould judge the object to be nearer than the diſtance at which it has viewed the object itſelf, in proportion to the degree of magnifying. For when the microſcope magnifies much, this rule would place the image at a diſtance, of which the ſight cannot poſſibly form any opinion, as being an interval from the eye at which no object can be ſeen. In general, he ſays, he believes, that whoever looks at an object through a convex glaſs, and then at the object itſelf without the glaſs, will find it to appear nearer in the latter caſe, though it be magnified in the glaſs; and in the ſame trial with the concave glaſs, though by the glaſs the object be diminiſhed, it will appear nearer through the glaſs than without it.

But the moſt convincing proof that the apparent diſtance of the image is not determined by its apparent magnitude, is the following experiment. If a double convex glaſs be held upright before ſome luminous object, as a candle, there will be ſeen two images, one erect, and the other inverted. The firſt is made ſimply by reflection from the neareſt ſurface, the ſecond by reflection from the farther ſurface, the rays undergoing a refraction from the firſt ſurface both before and after the reflection. If this glaſs has not too ſhort a focal diſtance when it is held near the object, the inverted image will appear larger than the other, and alſo nearer; but if the glaſs be carried off from the object, though the eye remain as near to it as before, the inverted image will diminiſh ſo much faſter than the other, that, at length, it will appear very much leſs than it, but ſtill nearer. Here, ſays Mr Robins, two images of the ſame ſubject are ſeen under one view, and their apparent diſtances immediately compared; and here it is evident, that thoſe diſtances have no neceſſary connexion with the apparent magnitude. He alſo ſhows how this experiment may be made ſtill more convincing, by ſticking a piece of paper on the middle of the lens, and viewing it through a ſhort tube.

216
M. Bouguer adopts Dr Barrow's maxim.

M. Bouguer adopts the general maxim of Dr Barrow, in ſuppoſing that we refer objects to the place from which the pencils of rays ſeemingly converge at their entrance into the pupil. But when rays iſſue from below the ſurface of a veſſel of water, or any other refracting medium, he finds that there are always two different places of this ſeeming convergence; one of them of the rays that iſſue from it in the ſame vertical circle, and therefore fall with different degrees of obliquity upon the ſurface of the refracting medium; and another, of thoſe that fall upon the ſurface with the ſame degree of obliquity, entering the eye laterally with reſpect to one another. Sometimes, he ſays, one of theſe images is attended to by the mind, and ſometimes the other, and different images may be obſerved by different perſons. An object plunged in water affords an example, he ſays, of this duplicity of images.

Plate CCCLXI.

If BA b (fig. 1.) be part of the ſurface of water, and the object be at O, there will be two images of it in two different places; one at G, on the cauſtic by refraction, and the other at E, in the perpendicular AO, which is as much a cauſtic as the other line. The former image is viſible by the rays ODM, O d m, which are one higher than the other, in their progreſs to the eye; whereas the image at E is made by the rays ODM, O r f, which enter the eye laterally. This, ſays he, may ſerve to explain the difficulty of Father Tacquet, Barrow, Smith, and many other authors, and which Newton himſelf conſidered as a very difficult problem, though it might not be abſolutely inſoluble.

G. W. Kraft has ably ſupported the opinion of Dr Barrow, that the place of any point, ſeen by reflection from the ſurface of any medium, is that in which rays iſſuing from it, infinitely near to one another, would meet; and conſidering the caſe of a diſtant object, viewed in a concave mirror, by an eye very near to it, when the image, according to Euclid and other writers would be between the eye and the object, and the rule of Dr Barrow cannot be applied; he ſays that in this caſe the ſpeculum may be conſidered as a plane, the effect being the ſame, only the image is more obſcure.

Dr Porterfield gives a diſtinct and comprehenſive view of the natural methods of judging concerning the diſtance of objects.

217
Dr Porterfield's view of the ſubject.

The conformation of the eye, he obſerves, can be of no uſe to us with reſpect to objects that are placed without the limits of diſtinct viſion. As the object, however, does then appear more or leſs confuſed, according as it is more or leſs removed from thoſe limits, this confuſion aſſiſts the mind in judging of the diſtance of the object; it being always eſteemed ſo much the nearer, or the farther off, by how much the confuſion is greater. But this confuſion hath its limits alſo beyond which it can never extend; for when an object is placed at a certain diſtance from the eye, to which the breadth of the pupil bears no ſenſible proportion, the rays of light that come from a point in the object, and paſs the pupil, are ſo little diverging, that they may be conſidered as parallel. For a picture on the retina will not be ſenſibly more confuſed, though the object be removed to a much greater diſtance.

The moſt univerſal, and frequently the moſt ſure means of judging of the diſtance of objects is, he ſays, the angle made by the optic axis. For our two eyes are like two different ſtations, by the aſſiſtance of which diſtances are taken; and this is the reaſon why thoſe perſons who are blind of one eye, ſo frequently miſs their marks in pouring liquor into a glaſs, ſnuffing a candle, and ſuch other actions as require that the diſtance be exactly diſtinguiſhed. To convince ourſelves of the uſefulneſs of this method of judging of the diſtance of objects, he directs us to ſuſpend a ring in a thread, ſo that its ſide may be towards us, and the hole in it to the right and left hand; and taking a ſmall rod, crooked at the end, retire from the ring two or three paces, and having with one hand covered one of our eyes, to endeavour with the other to paſs the crooked end of the rod through the ring. This, ſays he, appears very eaſy; and yet, upon trial, perhaps once in 100 times we ſhall not ſucceed, eſpecially if we move the rod a little quickly.

Our author obſerves, that by perſons recollecting the time when they began to be ſubject to the miſtakes above-mentioned, they may tell when it was that they loſt the uſe of one of their eyes; which many perſons are long ignorant of, and which may be a circumſtance of ſome conſequence to a phyſician †. The uſe of this ſecond method of judging of diſtances Dechales limited to 120 feet; beyond which, he ſays, we are not ſenſible of any difference in the angle of the optic axis.

† See *Medicine*, Nº 360.

A third method of judging of the diſtance of objects, conſiſts in their apparent magnitudes, on which ſo much ſtreſs was laid by Dr Smith. From this change in the magnitude of the image upon the retina, we eaſily judge of the diſtance of objects, as often as we are otherwiſe acquainted with the magnitude of the objects themſelves; but as often as we are ignorant of the real magnitude of bodies, we can never, from their apparent magnitude, form any judgment of their diſtance.

From this we may ſee why we are ſo frequently deceived in our eſtimates of diſtance, by any extraordinary magnitudes of objects ſeen at the end of it; as, in travelling towards a large city, or a caſtle, or a cathedral church, or a mountain larger than ordinary, we fancy them to be nearer than we find them to be. This alſo is the reaſon why animals, and all ſmall objects, ſeen in valleys, contiguous to large mountains, appear exceedingly ſmall. For we think the mountain nearer to us than if it were ſmaller; and we ſhould not be ſurpriſed at the ſmallneſs of the neighbouring animals, if we thought them farther off. For the ſame reaſon, we think them exceedingly ſmall, when they are placed upon the top of a mountain, or a large building; which appear nearer to us than they really are, on account of their extraordinary ſize.

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Why objects ſeen from a high building appear ſmaller than they are.

Dr Jurin clearly accounts for our imagining objects, when ſeen from a high building, to be ſmaller than they are, and ſmaller than we fancy them to be when we view them at the ſame diſtance on level ground. It is, ſays he, becauſe we have no diſtinct idea of diſtance in that direction, and therefore judge of things by their pictures upon the eye only; but cuſtom will enable us to judge rightly even in this caſe.

Let a boy, ſays he, who has never been upon any high building, go to the top of the monument, and look down into the ſtreet; the objects ſeen there, as men and horſes, will appear ſo ſmall as greatly to ſurpriſe him. But 10 or 20 years after, if in the mean time he has uſed himſelf now and then to look down from that and other great heights, he will no longer find the ſame objects to appear ſo ſmall. And if he was to view the ſame objects from ſuch heights as frequently as he ſees them upon the ſame level with himſelf in the ſtreets, he ſuppoſes that they would appear to him juſt of the ſame magnitude from the top of the monument, as they do from a window one ſtory high. For this reaſon it is, that ſtatues placed upon very high buildings ought to be made of a larger ſize than thoſe which are ſeen at a nearer diſtance; becauſe all perſons, except architects, are apt to imagine the height of ſuch buildings to be much leſs than it really is.

The fourth method by which Dr Porterfield ſays that we judge of the diſtance of objects, is the force with which their colour ſtrikes upon our eyes. For if we be aſſured that two objects are of a ſimilar and like colour, and that one appears more bright and lively than the other, we judge that the brighter object is the nearer of the two.

The fifth method conſiſts in the different appearance of the ſmall parts of objects. When theſe parts appear diſtinct, we judge that the object is near; but when they appear confuſed, or when they do not appear at all, we judge that it is at a greater diſtance. For the image of any object, or part of an object, diminiſhes as the diſtance of it increaſes.

The ſixth and laſt method by which we judge of the diſtance of objects is, that the eye does not repreſent to our mind one object alone, but at the ſame time all thoſe that are placed betwixt us and the principal object, whoſe diſtance we are conſidering; and the more this diſtance is divided into ſeparate and diſtinct parts, the greater it appears to be. For this reaſon, diſtances upon uneven ſurfaces appear leſs than upon a plane: for the inequalities of the ſurfaces, ſuch as hills, and holes, and rivers, that lie low and out of ſight, either do not appear, or hinder the parts that lie behind them from appearing; and ſo the whole apparent diſtance is diminiſhed by the parts that do

Apparent place, &c. of objects.

not appear in it. This is the reaſon that the banks of a river appear contiguous to a diſtant eye, when the river is low and not ſeen.

219
Several fallacies of viſion explained.

Dr Porterfield very well explains ſeveral fallacies in viſion depending upon our miſtaking the diſtances of objects. Of this kind, he ſays, is the appearance of parallel lines, and long viſtas conſiſting of parallel rows of trees; for they ſeem to converge more and more as they are farther extended from the eye. The reaſon of this, he ſays, is becauſe the apparent magnitudes of their perpendicular intervals are perpetually diminiſhing, while, at the ſame time, we miſtake their diſtance. Hence we may ſee why, when two parallel rows of trees ſtand upon an aſcent, whereby the more remote parts appear farther off than they really are, becauſe the line that meaſures the length of the viſtas now appears under a greater angle than when it was horizontal, the trees, in ſuch a caſe, will ſeem to converge leſs, and ſometimes, inſtead of converging, they will be thought to diverge.

For the ſame reaſon that a long viſta appears to converge more and more the farther it is extended from the eye, the remoter parts of a horizontal walk or a long floor will appear to aſcend gradually; and objects placed upon it, the more remote they are the higher they will appear, till the laſt be ſeen on a level with the eye; whereas the ceiling of a long gallery appears to deſcend towards a horizontal line, drawn from the eye of the ſpectator. For this reaſon, alſo, the ſurface of the ſea, ſeen from an eminence, ſeems to riſe higher and higher the farther we look; and the upper parts of high buildings ſeem to ſtoop, or incline forwards over the eye below, becauſe they ſeem to approach towards a vertical line proceeding from the ſpectator's eye; ſo that ſtatues on the top of ſuch buildings, in order to appear upright, muſt recline, or bend backwards.

Our author alſo ſhows the reaſon why a windmill, ſeen from a great diſtance, is ſometimes imagined to move the contrary way from what it really does, by our taking the nearer end of the ſail for the more remote. The uncertainty we ſometimes find in the courſe of the motion of a branch of lighted candles, turned round at a diſtance, is owing, he ſays, to the ſame cauſe; as alſo our ſometimes miſtaking a convex for a concave ſurface, more eſpecially in viewing ſeals and impreſſions with a convex glaſs or a double microſcope; and laſtly, that, upon coming in a dark night into a ſtreet, in which there is but one row of lamps, we often miſtake the ſide of the ſtreet they are on.

Far more light was thrown upon this curious ſubject by M. Bouguer.

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Great light thrown upon this ſubject by M. Bouguer.

The proper method of drawing the appearance of two rows of trees that ſhall appear parallel to the eye, is a problem which has exerciſed the ingenuity of ſeveral philoſophers and mathematicians. That the apparent magnitude of objects decreaſes with the angle under which they are ſeen, has always been acknowledged. It is alſo acknowledged, that it is only by cuſtom and experience that we learn to form a judgement both of magnitudes and diſtances. But in the application of theſe maxims to the above mentioned problem, all perſons, before M. Bouguer, made uſe of the real diſtance inſtead of the apparent one; by which only the mind can form its judgment. And it is manifeſt, that, if any circumſtances contribute to make the diſtance appear otherwiſe than it is in reality, the apparent magnitude of the object will be affected by it; for the ſame reaſon, that, if the magnitude be miſapprehended, the idea of the diſtance will vary.

Apparent place, &c. of objects.

For want of attending to this diſtinction, Tacquet pretended to demonſtrate, that nothing can give the idea of two parallel lines (rows of trees for inſtance) to an eye ſituated at one of their extremities, but two hyperbolical curves, turned the contrary way; and M. Varignon maintained, that in order to make a viſta appear of the ſame width, it muſt be made narrower, inſtead of wider, as it recedes from the eye.

M. Bouguer obſerves, that very great diſtances, and thoſe that are conſiderably leſs than they, make nearly the ſame impreſſion upon the eye. We, therefore, always imagine great diſtances to be leſs than they are; and for this reaſon the ground plan of a long viſta always appears to riſe. The viſual rays come in a determinate direction; but as we imagine that they terminate ſooner than they do, we neceſſarily conceive that the place from which they iſſue is elevated. Every large plane, therefore, as AB, (fig. 2.) viewed by an eye at O, will ſeem to lie in ſuch a direction as A*b*; and conſequently lines, in order to appear truly parallel on the plane AB, muſt be drawn ſo as that they would appear parallel on the plane A*d*, and be from thence projected to the plane AB.

Plate CCCLXV.

To determine the inclination of the apparent ground-plan A*d* to the true ground-plan AB, our ingenious author directs us to draw upon a piece of level ground two ſtraight lines of a ſufficient length (for which purpoſe lines faſtened to ſmall ſticks are very convenient), making an angle of 3 or 4 degrees with one another. Then a perſon, placing himſelf within the angle, with his back towards the angular point, muſt walk backwards and forwards till he can fancy the lines to be parallel. In this ſituation, a line drawn from the point of the angle through the place of his eye, will contain the ſame angle with the true ground-plan which this does with the apparent one.

M. Bouguer then ſhows other more geometrical methods of determining this inclination; and ſays; that by theſe means he has often found it to be 4 or 5 degrees, though ſometimes only 2 or 2½ degrees. The determination of this angle, he obſerves, is variable; depending upon the manner in which the ground is illuminated and the intenſity of the light. The colour of the ſoil is alſo not without its influence, as well as the particular conformation of the eye, by which it is more or leſs affected by the ſame degree of light, and alſo the part of the eye on which the object is painted. When, by a ſlight motion of his head, he contrived, that certain parts of the ſoil, the image of which fell towards the bottom of his eye, ſhould fall towards the top of the retina, he always thought that this apparent inclination became a little greater.

But what is very remarkable, and what he ſays he can aſſure his reader may be depended upon, is, that if he look towards a riſing ground, the difference between the apparent ground-plan and the true one will be much more conſiderable, ſo that they will ſometimes make an angle of 25 or 30 degrees. Of this he had made frequent obſervations. Mountains, he ſays, begin to be inacceſſible when their ſides make an angle from 35 to 37 degrees with the horizon, as then it is not poſſible to climb them but by means of ſtones or ſhrubs, to ſerve as ſteps to fix the feet on. In theſe caſes, both he and his companions always agreed that the apparent inclination of the ſide of the mountain was 60 or 70 degrees.

Plate CCCLXI

Theſe deceptions are repreſented in fig. 3. in which, when the ground-plan AM, or AN, is much inclined, the apparent ground-plan A*m*, or A*n*, makes a very large angle with it. On the contrary, if the ground dips below the level, the inclination of the apparent to the true ground-plan diminiſhes, till, at a certain degree of the ſlope, it becomes nothing at all; the two plans AP and A*p* being the ſame, ſo that parallel lines drawn upon them would always appear ſo. If the inclination below the horizon is carried beyond the ſituation AP, the error will increaſe; and what is very remarkable, it will be on the contrary ſide; the apparent plan A*r* being always below the true plan AR, ſo that if a perſon would draw upon the plan AR lines that ſhall appear parallel to the eye, they muſt be drawn converging, and not diverging, as is uſual on the level ground; becauſe they muſt be the projections of two lines imagined to be parallel, on the plan A*r*, which is more inclined to the horizon than AR.

Theſe remarks, he obſerves, are applicable to different planes expoſed to the eye at the ſame time. For if BH, fig. 4. be the front of a building, at the diſtance of AB from the eye, it will be reduced in appearance to the diſtance A*b*; and the front of the building will be *bh*, rather inclined towards the ſpectator, unleſs the diſtance be inconſiderable.

After making a great number of obſervations upon this ſubject, our author concludes, that when a man ſtands upon a level plane, it does not ſeem to riſe ſenſibly but at ſome diſtance from him. The apparent plane, therefore, has a curvature in it, at that diſtance, the form of which is not very eaſy to determine; ſo that a man ſtanding upon a level plane, of infinite extent, will imagine that he ſtands in the centre of a baſon. This is alſo, in ſome meaſure, the caſe with a perſon ſtanding upon the level of the ſea.

He concludes with obſerving, that there is no difficulty in drawing lines according to theſe rules, ſo as to have any given effect upon the eye, except when ſome parts of the proſpect are very near the ſpectator, and others very diſtant from him, becauſe, in this caſe, regard muſt be had to the conical or conoidal figure of a ſurface. A right line paſſing at a ſmall diſtance from the obſerver, and below the level of his eye, in that caſe almoſt always appears ſenſibly curved at a certain diſtance from the eye; and almoſt all figures in this caſe are ſubject to ſome complicated optical alteration to which the rules of perſpective have not as yet been extended. If a circle be drawn near our feet, and within that part of the ground which appears level to us, it will always appear to be a circle, and at a very conſiderable diſtance it will appear an ellipſe; but between theſe two ſituations, it will not appear to be either the one or the other, but will be like one of thoſe ovals of Deſcartes, which is more curved on one of its ſides than the other.

On theſe principles a parterre, which appears diſtorted when it is ſeen in a low ſituation, appears perfectly regular when it is viewed from a balcony or any other eminence. Still, however, the apparent irregularity takes place at a greater diſtance, while the part that is near the ſpectator is exempt from it. If AB, fig. 5. be the ground-plan, and A*a* be a perpendicular, under the eye, the higher it is ſituated, at O, to the greater diſtance will T, the place at which the plane begins to have an apparent aſcent along T*b*, be removed.

All the varieties that can occur with reſpect to the viſible motion of objects, are thus ſuccinctly ſummed up by Dr Porterfield under eleven heads.

1. An object moving very ſwiftly is not ſeen, unleſs it be very luminous. Thus a cannon ball is not ſeen if it is viewed tranſverſely: but if it be viewed according to the line it deſcribes, it may be ſeen, becauſe its picture continues long on the ſame place of the retina; which, therefore, receives a more ſenſible impreſſion from the object.

2. A live coal ſwung briſkly round in a circle appears a continued circle of fire, becauſe the impreſſions made on the retina by light, being of a vibrating, and conſequently of a laſting nature, do not preſently periſh, but continue till the coal performs its whole circuit, and returns again to its former place.

3. If two objects, unequally diſtant from the eye, move with equal velocity, the more remote one will appear the ſlower; or, if their celerities be proportional to their diſtances, they will appear equally ſwift.

4. If two objects, unequally diſtant from the eye, move with unequal velocities in the ſame direction, their apparent velocities are in a ratio compounded of the direct ratio of their true velocities, and the reciprocal one of their diſtances from the eye.

5. A viſible object moving with any velocity appears to be at reſt, if the ſpace deſcribed in the interval of one ſecond be imperceptible at the diſtance of the eye. Hence it is that a near object moving very ſlowly, as the index of a clock, or a remote one very ſwiftly, as a planet, ſeems to be at reſt.

6. An object moving with any degree of velocity will appear at reſt, if the ſpace it runs over in a ſecond of time be to its diſtance from the eye as 1 to 1400.

7. The eye proceeding ſtraight from one place to another, a lateral object, not too far off, whether on the right or left, will ſeem to move the contrary way.

8. The eye proceeding ſtraight from one place to another, and being ſenſible of its motion, diſtant objects will ſeem to move the ſame way, and with the ſame velocity. Thus, to a perſon running eaſtwards, the moon on his right hand appears to move the ſame way, and with equal ſwiftneſs; for, by reaſon of its diſtance, its image continues fixed upon the ſame place of the retina, from whence we imagine that the object moves along with the eye.

9. If the eye and the object move both the ſame way, only the eye much ſwifter than the object, the laſt will appear to go backwards.

10. If two or more objects move with the ſame velocity, and a third remain at reſt, the moveable ones will appear fixed, and the quieſcent in motion the

contrary way. Thus clouds moving very ſwiftly, their parts ſeem to preſerve their ſituation, and the moon to move the contrary way.

11. If the eye be moved with great velocity, lateral objects at reſt appear to move the contrary way. Thus to a perſon ſitting in a coach, and riding briſkly through a wood, the trees ſeem to retire the contrary way; and to people in a ſhip, &c. the ſhores ſeem to recede.

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Dr Porterfield's account of objects appearing to move to a giddy perſon when he and they are both at reſt.

At the concluſion of theſe obſervations, our author endeavours to explain another phenomenon of motion, which, though very common and well known, had not, ſo far as he knew, been explained in a ſatisfactory manner. It is this: If a perſon turns ſwiftly round, without changing his place, all objects about will ſeem to move round in a circle the contrary way; and this deception continues not only while the perſon himſelf moves round, but, which is more ſurpriſing, it alſo continues for ſome time after he ceaſes to move, when the eye, as well as the object, is at abſolute reſt.

The reaſon why objects appear to move round the contrary way, when the eye turns round, is not ſo difficult to explain: for though, properly ſpeaking, motion is not ſeen, as not being in itſelf the immediate object of ſight; yet by the ſight we eaſily know when the image changes its place on the retina, and thence conclude that either the object, the eye, or both, are moved. But by the ſight alone we can never determine how far this motion belongs to the object, how far to the eye, or how far to both. If we imagine the eye at reſt, we aſcribe the whole motion to the object, though it be truly at reſt. If we imagine the object at reſt, we aſcribe the whole motion to the eye, though it belongs entirely to the object; and when the eye is in motion, though we are ſenſible of its motion, yet, if we do not imagine that it moves ſo ſwiftly as it really does, we aſcribe only a part of the motion to the eye, and the reſt of it we aſcribe to the object, though it be truly at reſt. This laſt, he ſays, is what happens in the preſent caſe, when the eye turns round; for though we are ſenſible of the motion of the eye, yet we do not apprehend that it moves ſo faſt as it really does; and therefore the bodies about appear to move the contrary way, as is agreeable to experience.

But the great difficulty ſtill remains, viz. Why, after the eye ceaſes to move, objects ſhould, for ſome time, ſtill appear to continue in motion, though their pictures on the retina be truly at reſt, and do not at all change their place. This, he imagined, proceeds from a miſtake we are in with reſpect to the eye, which, though it be abſolutely at reſt, we nevertheleſs conceive as moving the contrary way to that in which it moved before; from which miſtake, with reſpect to the motion of the eye, the objects at reſt will appear to move the ſame way which the eye is imagined to move; and, conſequently, will ſeem to continue their motion for ſome time after the eye is at reſt.

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Dr Wells accounts for this phenomenon.

This is ingenious, but perhaps not juſt. An account of this matter, which ſeems to us more ſatisfactory, has been lately given to the public by Dr Wells. "Some of the older writers upon optics (ſays this able philoſopher) imagined the viſive ſpirits to be contained in the head, as water is in a veſſel; which, therefore, when once put in motion by the rotation of our bodies, muſt continue in it for ſome time after this has ceaſed; and to this real circular movement of the viſive ſpirits, while the body is at reſt, they attributed the apparent motions of objects in giddineſs. Dechales ſaw the weakneſs of this hypotheſis; and conjectured, that the phenomenon might be owing to a real movement of the eyes; but produced no fact in proof of his opinion. Dr Porterfield, on the contrary, ſuppoſed the difficulty of explaining it to conſiſt in ſhowing, why objects at reſt appear in motion to an eye which is alſo at reſt. The ſolution he offered of this repreſentation of the phenomenon, is not only extremely ingenious, but is I believe the only probable one which can be given. It does not apply, however, to the fact which truly exiſts; for I ſhall immediately ſhow, that the eye is not at reſt, as he imagined. The laſt author I know of who has touched upon this ſubject is Dr Darwin. His words are, 'When any one turns round rapidly on one foot till he becomes dizzy, and falls upon the ground, the ſpectra of the ambient objects continue to preſent themſelves in rotation, or appear to librate, and he ſeems to behold them for ſome time in motion.' I do not indeed pretend to underſtand his opinion fully; but this much ſeems clear, that if ſuch an apparent motion of the ſurrounding objects depends in any way upon their ſpectra, or the illuſive repreſentations of thoſe objects, occaſioned by their former impreſſions upon the retinas, no ſimilar motion would be obſerved, were we to turn ourſelves round with our eyes ſhut, and not to open them till we became giddy; for in this caſe, as the ſurrounding objects could not ſend their pictures to the retinas, there would conſequently be no ſpectra to preſent themſelves afterwards in rotation. But whoever will make the experiment, will find, that objects about him appear to be equally in motion, when he has become giddy by turning himſelf round, whether this has been done with his eyes open or ſhut. I ſhall now venture to propoſe my own opinion upon this ſubject.

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Upon what data we judge viſible objects to be in motion or at reſt.

"If the eye be at reſt, we judge an object to be in motion when its picture falls in ſucceeding times upon different parts of the retina; and if the eye be in motion, we judge an object to be at reſt, as long as the change in the place of its picture upon the retina holds a certain correſpondence with the change of the eye's poſition. Let us now ſuppoſe the eye to be in motion, while, from ſome diſorder in the ſyſtem of ſenſation, we are either without thoſe feelings which indicate the various poſitions of the eye, or are not able to attend to them. It is evident, that in ſuch a ſtate of things an object at reſt muſt appear to be in motion, ſince it ſends in ſucceeding times its picture to different parts of the retina. And this ſeems to be what happens in giddineſs. I was firſt led to think ſo from obſerving, that, during a ſlight fit of giddineſs I was accidentally ſeized with, a coloured ſpot, occaſioned by looking ſteadily at a luminous body, and upon which I happened at that moment to be making an experiment, was moved in a manner altogether independent of the poſitions I conceived my eyes to poſſeſs. To determine this point, I again produced the ſpot, by looking ſome time at the flame of a candle: then turning myſelf round till I became giddy, I ſuddenly diſcontinued this motion, and directed my eyes to the middle of a ſheet of paper, fixed upon the wall of my chamber. The ſpot now appeared upon the paper, but only for a moment; for it immediately after ſeemed to move to one ſide, and the paper to the other, notwithſtanding I conceived the poſition of my eyes to be in the mean while unchanged.

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Curious experiments to aſcertain this.

To go on with the experiment, when the paper and ſpot had proceeded to a certain diſtance from each other, they ſuddenly came together again; and this ſeparation and conjunction were alternately repeated a number of times, the limits of the ſeparation gradually becoming leſs, till at length the paper and ſpot both appeared to be at reſt, and the latter to be projected upon the middle of the former. I found alſo, upon repeating and varying the experiment a little, that when I had turned myſelf from left to right, the paper moved from right to left, and the ſpot conſequently the contrary way; but that when I had turned from right to left, the paper would then move from left to right. Theſe were the appearances obſerved while I ſtood erect. When I inclined, however, my head in ſuch a manner as to bring the ſide of my face parallel to the horizon, the ſpot and paper would then move from each other, one upward and the other downward. But all theſe phenomena demonſtrate, that there was a real motion in my eyes at the time I imagined them to be at reſt; for the apparent ſituation of the ſpot, with reſpect to the paper, could not poſſibly have been altered, without a real change of the poſition of thoſe organs. To have the ſame thing proved in another way, I deſired a perſon to turn quickly round, till he became very giddy; then to ſtop himſelf, and look ſtedfaſtly at me. He did ſo, and I could plainly ſee, that although he thought his eyes were fixed, they were in reality moving in their ſockets, firſt toward one ſide and then toward the other."

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A remarkable deception explained by M. le Cat. Plate CCCLXI.

M. Le Cat well explains a remarkable deception, by which a perſon ſhall imagine an object to be on the oppoſite ſide of a board, when it is not ſo, and alſo inverted and magnified. It is illuſtrated by fig. 6. in which D repreſents the eye, and CB a large black board, pierced with a ſmall hole. E is a large white board, placed beyond it, and ſtrongly illuminated; and *d* a pin, or other ſmall object, held betwixt the eye and the firſt board. In theſe circumſtances, the pin ſhall be imagined to be at F, on the other ſide of the board, where it will appear inverted and magnified; becauſe what is in fact perceived, is the ſhadow of the pin upon the retina; and the light that is ſtopped by the upper part of the pin coming from the lower part of the enlightened board, and that which is ſtopped by the lower part coming from the upper part of the board, the ſhadow muſt neceſſarily be inverted with reſpect to the object.

There is a curious phenomenon relating to viſion, which ſome perſons have aſcribed to the inflection of light, but which Mr Melville explains in a very different and very ſimple manner.

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A curious phenomenon explained by Mr Melville.

When any opaque body is held at the diſtance of three or four inches from the eye, ſo that a part of ſome more diſtant luminous object, ſuch as the window, or the flame of a candle, may be ſeen by rays paſſing near its edge, if another opaque body, nearer to the eye, be brought acroſs from the oppoſite ſide, the edge of the firſt body will ſeem to ſwell outwards, and meet the latter; and in doing ſo will intercept a portion of the luminous object that was ſeen before.

This appearance he explains in the following manner: Let AB (fig. 7.) repreſent the luminous object to which the ſight is directed, CD the more diſtant opaque body, GH the nearer, and EF the diameter of the pupil. Join ED, FD, EG, FG, and produce them till they meet AB in K, N, M, and L. It is plain that the parts AN, MB, of the luminous object cannot be ſeen. But taking any point *a* between N and K, and drawing *a* D *d*, ſince the portion *d* F of the pupil is filled with light flowing from that point, it muſt be viſible. Any point *b*, between *a* and K, muſt fill *f* F, a greater portion of the pupil, and therefore muſt appear brighter. Again, Any point *c*, between *b* and K, muſt appear brighter than *b*, becauſe it fills a greater portion *g* F with light. The point K itſelf, and every other point in the ſpace KL, muſt appear very luminous, ſince they ſend entire pencils of rays EKF, ELF, to the eye; and the viſible brightneſs of every point from L towards M, muſt decreaſe gradually, as from K to N, that is, the ſpaces KN, LM, will appear as dim ſhadowy borders, or fringes, adjacent to the edges of the opaque bodies.

When the edge G is brought to touch the right line KF, the penumbras unite; and as ſoon as it reaches NDF, the above phenomenon begins; for it cannot paſs that right line without meeting ſome line *a* D *d*, drawn from a point between N and K, and, by intercepting all the rays that fall upon the pupil, render it inviſible. In advancing gradually to the line KDE, it will meet other lines *b* D *f*, *c* D *g*, &c. and therefore render the points *b*, *c*, &c. from N to K, ſucceſſively inviſible; and therefore the edge of the fixed opaque body CD muſt ſeem to ſwell outwards, and cover the whole ſpace NK; while GH, by its motion, covers MK. When GH is placed at a greater diſtance from the eye, CD continuing fixed, the ſpace OP to be paſſed over in order to intercept NK is leſs; and therefore, with an equal motion of GH, the apparent ſwelling of CD muſt be quicker; which is found true by experience.

If ML repreſent a luminous object, and REFQ any plane expoſed to its light, the ſpace FQ will be entirely ſhaded from the rays, and the ſpace FE will be occupied by a penumbra, gradually darker, from E to F. Let now GH continue fixed, and CD move parallel to the plane EF; and as ſoon as it paſſes the line LF, it is evident that the ſhadow QF will ſeem to ſwell outwards; and when CD reaches ME, ſo as to cover with its ſhadow the ſpace RE, QF, by its extenſion, will cover FE. This is found to hold true likewiſe by experiment.

§ 4. *Of the Concave Figure of the Sky.*

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Extent of the viſible horizon on a plane ſurface.

This apparent concavity is only an optical deception founded on the incapacity of our organs of viſion to take in very large diſtances. Dr Smith, in his Complete Syſtem of Optics, hath demonſtrated, that, if the ſurface of the earth was perfectly plane, the diſtance of the viſible horizon from the eye would ſcarce exceed the diſtance of 5000 times the height of the eye above the ground, ſuppoſing the height of the eye between five and ſix feet: beyond this diſtance, Plate CCCLXI. fig. 8.

all objects would appear in the viſible horizon. For, let OP be the height of the eye above the line PA drawn upon the ground; and if an object AB, equal in height to PO, be removed to a diſtance PA equal to 5000 times that height, it will hardly be viſible by reaſon of the ſmallneſs of the angle AOB. Conſequently any diſtance AC, how great ſoever, beyond A, will be inviſible. For ſince AC and BO are parallel, the ray CO will always cut AB in ſome point D between A and B; and therefore the angle AOC, or AOD, will always be leſs than AOB, and therefore AD or AC will be inviſible. Conſequently all objects and clouds, as CE and FG, placed at all diſtances beyond A, if they be high enough to be viſible, or to ſubtend a bigger angle at the eye than AOB, will appear at the horizon AB; becauſe the diſtance AC is inviſible.

228 Why a long row of objects appears circular.

Hence, if we ſuppoſe a vaſt long row of objects, or a vaſt long wall ABZY (fig. 9.), built upon this plane, and its perpendicular diſtance OA from the eye at O to be equal to or greater than the diſtance O *a* of the viſible horizon, it will not appear ſtraight, but circular, as if it was built upon the circumference of the horizon *a e e g y*: and if the wall be continued to an immenſe diſtance, its extreme parts YZ will appear in the horizon at *y z*, where it is cut by a line O*y* parallel to the wall. For, ſuppoſing a ray YO, the angle YO*y* will become inſenſibly ſmall. Imagine this infinite plane OAY*y*, with the wall upon it, to be turned about the horizontal line O like the lid of a box, till it becomes perpendicular to the other half of the horizontal plane LM*y*, and the wall parallel to it, like a vaſt ceiling overhead; and then the wall will appear like the concave figure of the clouds overhead. But though the wall in the horizon appear in the figure of a ſemicircle, yet the ceiling will not, but much flatter. Becauſe the horizontal plane was a viſible ſurface, which ſuggeſted the idea of the ſame diſtances quite round the eye: but in the vertical plane extended between the eye and the ceiling, there is nothing that affects the ſenſe with an idea of its parts but the common line O*y*; conſequently the apparent diſtances of the higher parts of the ceiling will be gradually diminiſhed in aſcending from that line. Now when the ſky is quite overcaſt with clouds at equal gravities, they will all float in the air at equal heights above the earth, and conſequently will compoſe a ſurface reſembling a large ceiling, as flat as the viſible ſurface of the earth. Its concavity therefore is not real, but apparent: and when the heights of the clouds are unequal, ſince their real ſhapes and magnitudes are all unknown, the eye can ſeldom diſtinguiſh the unequal diſtances of thoſe clouds that appear in the ſame directions, unleſs when they are very near us, or are driven by contrary currents of the air. So that the viſible ſhape of the whole ſurface remains alike in both caſes. And when the ſky is either partly overcaſt or partly free from clouds, it is matter of fact that we retain much the ſame idea of its concavity as when it was quite overcaſt.

229 Why the concavity of the ſky appears leſs than a hemiſphere.

The concavity of the heavens appears to the eye, which is the only judge of an apparent figure, to be a leſs portion of a ſpherical ſurface than a hemiſphere. Dr Smith ſays, that the centre of the concavity is much below the eye: and by taking a medium among ſeveral obſervations, he found the apparent diſtance of its parts at the horizon to be generally between three and four times greater than the apparent diſtance of its parts overhead. Fig. 10. For let the arch ABCD repreſent the apparent concavity of the ſky, O the place of the eye, OA and OC the horizontal and vertical apparent diſtances, whoſe proportion is required. Firſt obſerve when the ſun or the moon, or any cloud or ſtar, is in ſuch a ſituation at B, that the apparent arches BA, BC, extended on each ſide of this object towards the horizon and zenith, ſeem equal to the eye; then taking the altitude of the object B with a quadrant, or a croſs ſtaff, or finding it by aſtronomy from the given time of obſervation, the angle AOB is known. Drawing therefore the line OB in the poſition thus determined, and taking in it any point B at pleaſure, in the vertical line CO produced downwards, ſeek the centre E of a circle ABC, whoſe arches BA, BC, intercepted between B and the legs of the right angle AOC, ſhall be equal to each other; then will this arch ABCD repreſent the apparent figure of the ſky. For by the eye we eſtimate the diſtance between any two objects in the heavens by the quantity of ſky that appears to lie between them; as upon earth we eſtimate it by the quantity of ground that lies between them. The centre E may be found geometrically by conſtructing a cubic equation, or as quickly and ſufficiently exact by trying whether the chords BA, BC, of the arch ABC drawn by conjecture are equal, and by altering its radius BE till they are ſo. Now in making ſeveral obſervations upon the ſun, and ſome others upon the moon and ſtars, they ſeemed to our author to biſect the vertical arch ABC at B, when their apparent altitudes or the angle AOB was about 23 degrees; which gives the proportion of OC to OA as 3 to 10 or as 1 to $3\frac{1}{3}$ nearly. When the ſun was but 30 degrees high, the upper arch ſeemed always leſs than the under one; and, in our author's opinion, always greater when the ſun was about 18 or 20 degrees high.

§ 5. *Of the Blue Colour of the Sky, and of Blue and Green Shadows.*

230 Opinions of the ancients reſpecting the colour of the ſky.

The opinions of ancient writers concerning the colour of the ſky merit no notice. The firſt who gave any rational explanation was Fromondus. By him it was ſuppoſed, that the blueneſs of the ſky proceeded from a mixture of the white light of the ſun with the black ſpace beyond the atmoſphere, where there is neither refraction nor reflection. This opinion prevailed very generally even in modern times, and was maintained by Otto Guerick and all his cotemporaries, who aſſerted, that white and black may be mixed in ſuch a manner as to make a blue. M. Bouguer had recourſe to the vapours diffuſed through the atmoſphere, to account for the reflection of the blue rays rather than any other. He ſeems however to ſuppoſe, that it ariſes from the conſtitution of the air itſelf, whereby the fainter coloured rays are incapable of making their way through any conſiderable tract of it. Hence he is of opinion, that the colour of the air is properly blue; to which opinion Dr Smith ſeems alſo to have inclined.

To this blue colour of the ſky is owing the appearance of blue and green ſhadows in the mornings and evenings.—Theſe were firſt taken notice of by M. Buffon in the month of July 1742, when he obſerved that the ſhadows of trees which fell upon a white wall were green. He was at that time ſtanding upon an eminence, and the ſun was ſetting in the cleft of a mountain, ſo that he appeared conſiderably lower than the horizon. The ſky was clear, excepting in the weſt, which, though free from clouds, was lightly ſhaded with vapours, of a yellow colour, inclining to red. Then the ſun itſelf was exceedingly red, and was ſeemingly at leaſt four times as large as he appears to be at mid-day. In theſe circumſtances, he ſaw very diſtinctly the ſhadows of the trees, which were 30 or 40 feet from the white wall, coloured with a light green inclining to blue. The ſhadow of an arbour which was three feet from the wall, was exactly drawn upon it, and looked as if it had been newly painted with verdigriſe. This appearance laſted near five minutes; after which it grew fainter, and vaniſhed at the ſame time with the light of the ſun.

231 Green ſhadows obſerved by M. Buffon.

232 Blue ſhadows obſerved by him.

The next morning at ſunriſe, he went to obſerve other ſhadows, upon another white wall; but inſtead of finding them green as he expected, he obſerved that they were blue, or rather of the colour of lively indigo. The ſky was ſerene, except a ſlight covering of yellowiſh vapours in the eaſt; and the ſun aroſe behind a hill, ſo that it was elevated above his horizon. In theſe circumſtances, the blue ſhadows were only viſible three minutes; after which they appeared black, and in the evening of the ſame day he obſerved the green ſhadows exactly as before. Six days paſſed without his being able to repeat his obſervations, on account of the clouds; but the ſeventh day at ſunſet, the ſhadows were not green, but of a beautiful ſky-blue. He alſo obſerved, that the ſky was in a great meaſure free from vapours at that time; and that the ſun ſet behind a rock, ſo that it diſappeared before it came to his horizon. Afterwards he often obſerved the ſhadows both at ſunriſe and ſunſet; but always obſerved them to be blue, though with a great variety of ſhades of that colour. He ſhowed this phenomenon to many of his friends, who were as much ſurpriſed at it as he himſelf had been; but he ſays that any perſon may ſee a blue ſhadow, if he will only hold his finger before a piece of white paper at ſunriſe or ſunſet.

233 Explanation of theſe phenomena attempted by Abbé Mazeas.

The firſt perſon who attempted to explain this phenomenon was the Abbé Mazeas, in a memoir of the ſociety in Berlin for the year 1752. He obſerved, that when an opaque body was illuminated by the moon and a candle at the ſame time, and the two ſhadows were caſt upon the ſame white wall, that which was enlightened by the candle was reddiſh, and that which was enlightened by the moon was blue. But, without attending to any other circumſtances, he ſuppoſed the change of colour to be occaſioned by the diminution of the light; but M. Melville, and M. Bouguer, both independent of one another, ſeem to have hit upon the true cauſe of this curious appearance, and which hath been already hinted at. The former of theſe gentlemen, in his attempts to explain the blue colour of the ſky, obſerves, that ſince it is certain that no body aſſumes any particular colour, but becauſe it reflects one ſort of rays more abundantly than the reſt; and ſince it cannot be ſuppoſed that the conſtituent parts of pure air are groſs enough to ſeparate any colours of themſelves; we muſt conclude with Sir Iſaac Newton, that the violet and blue-making rays are reflected more copiouſly than the reſt, by the finer vapours diffuſed through the atmoſphere, whoſe parts are not big enough to give them the appearance of viſible opaque clouds. And he ſhows that in proper circumſtances, the bluiſh colour of the ſky light may be actually ſeen on bodies illuminated by it, as, he ſays, it is objected ſhould always happen upon this hypotheſis. For that if, on a clear cloudleſs day, a ſheet of white paper be expoſed to the ſun's beams, when any opaque body is placed upon it, the ſhadow which is illuminated by the ſky only will appear remarkably bluiſh compared with the reſt of the paper, which receives the ſun's direct rays.

234 Melville's and Bouguer's explanation.

M. Bouguer, who has taken the moſt pains with this ſubject, obſerves, that as M. Buffon mentions the ſhadows appearing green only twice, and that at all other times they were blue, this is the colour which they regularly have, and that the blue was changed into green by ſome accidental circumſtance. Green, he ſays, is only a compoſition of blue and yellow, ſo that this accidental change may have ariſen from the mixture of ſome yellow rays in the blue ſhadow; and that perhaps the wall might have had that tinge, ſo that the blue is the only colour for which a general reaſon is required. And this, he ſays, muſt be derived from the colour of pure air, which always appears blue, and which always reflects that colour upon all objects without diſtinction; but which is too faint to be perceived when our eyes are ſtrongly affected by the light of the ſun, reflected from other objects around us.

235 Curious obſervations relating to this ſubject.

To confirm this hypotheſis, he adds ſome curious obſervations of his own, in which this appearance is agreeably diverſified. Being at the village of Boucholtz in July 1764, he obſerved the ſhadows projected on the white paper of his pocket-book when the ſky was clear. At half an hour paſt 6 in the evening, when the ſun was about four degrees high, he obſerved that the ſhadow of his finger was of a dark gray, while he held the paper oppoſite to the ſun; but when he inclined it almoſt horizontally, the paper had a bluiſh caſt, and the ſhadow upon it was of a beautiful bright blue.

When his eye was placed between the ſun and the paper laid horizontally, it always appeared of a bluiſh caſt; but when he held the paper thus inclined between his eye and the ſun, he could diſtinguiſh, upon every little eminence occaſioned by the inequality of the ſurface of the paper, the principal of the priſmatic colours. He alſo perceived them upon his nails, and upon the ſkin of his hand. This multitude of coloured points, red, yellow, green, and blue, almoſt effaced the natural colour of the objects.

At three quarters paſt ſix, the ſhadows began to be blue, even when the rays of the ſun fell perpendicularly. The colour was the moſt lively when the rays fell upon it at an angle of 45 degrees; but with a leſs inclination of the paper, he could diſtinctly perceive, that the blue ſhadow had a border of a ſtronger blue on that ſide which looked towards the ſky, and a red border on that ſide which was turned towards the earth. To ſee theſe borders, the body that made the ſhadow was obliged to be placed very near the paper; and the nearer it was the more ſenſible was the red border. At the diſtance of three inches, the whole ſhadow was blue. At every obſervation, after having held the paper towards the ſky, he turned it towards the earth, which was covered with verdure; holding it in ſuch a manner, that the ſun might ſhine upon it while it received the ſhadows of various bodies; but in this poſition he could never perceive the ſhadow to be blue or green at any inclination with reſpect to the ſun's rays.

At ſeven o'clock, the ſun being ſtill about two degrees high, the ſhadows were of a bright blue, even when the rays fell perpendicularly upon the paper, but were the brighteſt when it was inclined at an angle of 45°. At this time he was ſurpriſed to obſerve, that a large tract of ſky was not favourable to this blue colour, and that the ſhadow falling upon the paper placed horizontally was not coloured, or at leaſt the blue was very faint. This ſingularity, he concluded, aroſe from the ſmall difference between the light of that part of the paper which received the rays of the ſun and that which was in the ſhade in this ſituation. In a ſituation preciſely horizontal, the difference would vaniſh, and there could be no ſhadow. Thus too much or too little of the ſun's light produced, but for different reaſons, the ſame effect; for they both made the blue light reflected from the ſky to become inſenſible. This gentleman never ſaw any green ſhadows, but when he made them fall on yellow paper. But he does not abſolutely ſay that green ſhadows cannot be produced in any other manner; and ſuppoſes, that if it was on the ſame wall that M. Buffon ſaw the blue ſhadows, ſeven days after having ſeen the green ones, the cauſe of it might be the mixture of yellow rays, reflected from the vapours, which he obſerves were of that colour.

236
Blue ſhadows not confined to the mornings and evenings.

These blue ſhadows, our author obſerves, are not confined to the times of the ſunriſing and ſunſetting; on the 19th of July, when the ſun has the greateſt force, he obſerved them at three o'clock in the afternoon, but the ſun ſhone through a miſt at that time.

If the ſky is clear, the ſhadows begin to be blue; when, if they be projected horizontally, they are eight times as long as the height of the body that produces them, that is, when the centre of the ſun is 7° 8′ above the horizon. This obſervation, he ſays, was made in the beginning of Auguſt.

Beſides theſe coloured ſhadows, which are produced by the interception of the direct rays of the ſun, our author obſerved others ſimilar to them at every hour of the day, in rooms into which the light of the ſun was reflected from ſome white body, if any part of the clear ſky could be ſeen from the place, and all unneceſſary light was excluded as much as poſſible. Obſerving theſe precautions, he ſays that the blue ſhadows may be ſeen at any hour of the day, even with the direct light of the ſun; and that this colour will diſappear in all thoſe places of the ſhadow from which the blue ſky cannot be ſeen.

All the obſervations that our author made upon the yellow or reddiſh borders of ſhadows above mentioned, led him to conclude, that they were occaſioned by the interception of the ſky light, whereby part of the ſhadow was illuminated either by the red rays reflected from the clouds, when the ſun is near the horizon, or from ſome terreſtrial bodies in the neighbourhood. This conjecture is favoured by the neceſſity he was under of placing any body near the paper, in order to produce this bordered ſhadow, as he ſays it is eaſily demonſtrated, that the interception of the ſky light can only take place when the breadth of the opaque body is to its diſtance from the white ground on which the ſhadow falls, as twice the ſine of half the amplitude of the ſky to its coſine.

237
Another kind of ſhadows.

At the concluſion of his obſervations on theſe blue ſhadows, he gives a ſhort account of another kind of them, which, he does not doubt, have the ſame origin. Theſe he often ſaw early in the ſpring when he was reading by the light of a candle in the morning, and conſequently the twilight mixed with that of his candle. In theſe circumſtances, the ſhadow that was made by intercepting the light of his candle, at the diſtance of about ſix feet, was of a beautiful and clear blue, which became deeper as the opaque body which made the ſhadow was brought nearer to the wall, and was exceedingly deep at the diſtance of a few inches only. But wherever the day light did not come, the ſhadows were all black without the leaſt mixture of blue.

§ 6. *Of the Irradiations of the Sun's Light appearing through the interſtices of the Clouds.*

This is an appearance which every one muſt have obſerved when the ſky was pretty much overcaſt with clouds at ſome diſtance from each other. At that time ſeveral large beams of light, ſomething like the appearance of the light of the ſun admitted into a ſmoky room, will be ſeen generally with a very conſiderable degree of divergence, as if the radiant point was ſituated at no great diſtance above the clouds. Dr Smith obſerves that this appearance is one of thoſe which ſerve to demonſtrate that very high and remote objects in the heavens do not appear to us in their real ſhapes and poſitions, but according to their perſpective projections on the apparent concavity of the ſky. He acquaints us, that though theſe beams are generally ſeen diverging, as repreſented in fig. 11. it is not always the caſe. He himſelf, in particular, once ſaw them converging towards a point diametrically oppoſite to the ſun: for, as near as he could conjecture, the point to which they converged was ſituated as much below the horizon as the ſun was then elevated above the oppoſite part of it. This part is repreſented by the line *t*D*t*, and the point below it in oppoſition to the ſun is E; towards which all the beams *vt*, *vt*, &c. appeared to converge.

Plate CCCLXI.

238
Converging irradiations obſerved by Dr Smith.

Fig 12.

239
The phenomenon explained by him.

"Obſerving (ſays our author) that the point of convergence was oppoſite to the ſun, I began to ſuſpect that this unuſual phenomenon was but a caſe of the uſual apparent divergence of the beams of the ſun from his apparent place among the clouds, as repreſented in fig. 11. I ſay an apparent divergence; for though nothing is more common than for rays to diverge from a luminous body, yet the divergence of theſe beams in ſuch large angles is not real, but apparent. Becauſe it is impoſſible for the direct rays of the ſun to croſs one another at any point of the apparent concavity of the ſky, in a greater angle than about half a degree. For the diameter of the earth being ſo extremely ſmall, in compariſon to the diſtance of the ſun, as to ſubtend an angle at any point of his body of but 20 or 22 ſeconds at moſt; and the diameter of our viſible horizon being extremely ſmaller than that of the earth; it is plain, that all the rays which fall upon the horizon from any given point of the ſun, muſt be inclined to each other in the ſmalleſt angles imaginable: the greateſt of them being as much ſmaller than that angle of 22 ſeconds, as the diameter of the viſible horizon is ſmaller than that of the earth. All the rays that come to us from Plate CCLXI. fig. 13. any given point of the ſun may therefore be conſidered as parallel to each other; as the rays *e*B*g* from the point *e*, or *f*B*h* from the oppoſite point *f*; and conſequently the rays of theſe two pencils that come from oppoſite points of the ſun's real diameter, and croſs each other in the ſun's apparent place B among the clouds, can conſtitute no greater an angle with each other than about half a degree; this angle of their interſection *e*B*f* being the ſame as the ſun would appear under to an eye placed among the clouds at B, or (which is much the ſame) to an eye at O upon the ground. Becauſe the ſun's real diſtance OS is inconceivably greater than his apparent diſtance OB. Therefore the rays of the ſun, as B*g*, B*h*, do really diverge from his apparent place B in no greater angles *g*B*h* than about Fig. 13. half a degree. Nevertheleſs they appear to diverge from the place B in all poſſible angles, and even in oppoſite directions. Let us proceed then to an explanation of this apparent divergence, which is not ſelf-evident by any means; though at firſt ſight we are apt to think it is, by not diſtinguiſhing the vaſt difference between the true and apparent diſtances of the ſun.

"What I am going to demonſtrate is this. Suppoſing all the rays of the ſun to fall accurately parallel to each other upon the viſible horizon, as they do very nearly, yet in both caſes they muſt appear to diverge in all poſſible angles. Let us imagine the heavens to be partly overcaſt with a ſpacious bed of broken Fig. 14. clouds, *v*, *v*, *v*, &c. lying parallel to the plane of the viſible horizon, here repreſented by the line AOD; and when the ſun's rays fall upon theſe clouds in the parallel lines *s v*, *s v*, &c. let ſome of them paſs through their intervals in the lines *v t*, *v t*, &c. and fall upon the plane of the horizon at the places *t*, *t*, &c. And ſince the reſt of the incident rays *s v*, *s v*, are ſuppoſed to be intercepted from the place of the ſpectator at O by the cloud *x*, and from the intervals between the tranſmitted rays *v t*, *v t*, &c. by the clouds *v*, *v*, &c. a ſmall part of theſe latter rays *v t*, *v t*, when reflected every way from ſome certain kind of thin vapours floating in the air, may undoubtedly be ſufficient to affect the eye with an appearance of lights and ſhades, in the form of bright beams in the places *v t*, *v t*, &c. and of dark ones in the intervals between them; juſt as the like beams of light and ſhade appear in a room by reflections of the ſun's rays from a ſmoky or duſty air within it; the lights and ſhades being here occaſioned by the tranſmiſſion of the rays through ſome parts of the window, and by their interruption at other parts.

"Now, if the apparent concavity of this bed of clouds *v*, *v*, to the eye at O, be repreſented by the arch ABCD, and be cut in the point B by the line OB*x* drawn parallel to the beams *t v*; it will be evident by the rules of perſpective, that theſe long beams will not appear in their real places, but upon the concave ABCD diverging every way from the place B, where the ſun himſelf appears, or the cloud *x* that covers his body, as repreſented ſeparately in full view in fig. 11.

"And for the ſame reaſon, if the line BO be produced towards E, below the plane of the horizon AOD, and the eye be directed towards the region of the ſky directly above E, the lower ends of the ſame real beams *v t*, *v t*, will now appear upon the part DF of this concave; and will ſeem to converge towards the point E, ſituated juſt as much below the horizon as the oppoſite point B is above it: which is ſeparately repreſented in full view in fig. 12.

"For if the beams *v t*, *v t*, be ſuppoſed to be viſible throughout their whole lengths, and the eye be directed in a plane perpendicular to them, here repreſented by the line OF; they and their intervals will appear broadeſt in and about this plane, becauſe theſe parts of them are the neareſt to the eye; and therefore their remoter parts and intervals will appear gradually narrower towards the oppoſite ends of the line BE. As a farther illuſtration of this matter, we may conceive the ſpectator at O to be ſituated upon the top of ſo large a deſcent OHI towards a remote valley IK, and the ſun to be ſo very low, that the point E, oppoſite to him, may be ſeen above the horizon of this ſhady valley. In this caſe it is manifeſt, that the ſpectators at O would now ſee theſe beams converging ſo far as to meet each other at the point E in the ſky itſelf.

240 Not obſerved by moon light.

"I do not remember to have ever ſeen any phenomenon of this kind by moon light; not ſo much as of beams diverging from her apparent place. Probably her light is too weak after reflections from any kind of vapours, to cauſe a ſenſible appearance of lights and ſhades ſo as to form theſe beams. And in the unuſual phenomenon I well remember, that the converging ſun beams towards the point below the horizon were not quite ſo bright and ſtrong as thoſe uſually are that diverge from him; and that the ſky beyond them appeared very black (ſeveral ſhowers having paſſed that way), which certainly contributed to the evidence of this appearance. Hence it is probable that the thinneſs and weakneſs of the reflected rays from the vapours oppoſite to the ſun, is the chief cauſe that this appearance is ſo very uncommon in compariſon to that other of diverging beams. For as the region of the ſky round about the ſun is always brighter than the oppoſite one, ſo the light of the diverging beams ought alſo to be brighter than that of the converging ones. For, though rays are reflected from rough unpoliſhed bodies in all poſſible directions, yet it is a general obſervation, that more of them are reflected forwards obliquely, than are reflected more directly backwards. Beſides, in the preſent caſe, the incident rays upon the oppoſite region to the ſun, are more diminiſhed by continual reflections from a longer track of the atmoſphere, than the incident rays upon the region next the ſun.

241 The phenomenon of diverging beams more frequent in ſummer than in winter.

"The common phenomenon of diverging beams, I think, is more frequent in ſummer than in winter, and alſo when the ſun is lower than when higher up; probably becauſe the lower vapours are denſer, and therefore more ſtrongly reflective than the higher; becauſe the lower ſky light is not ſo bright as the upper;

Fig. 1.

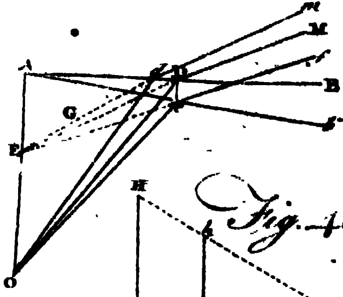


Fig. 2.

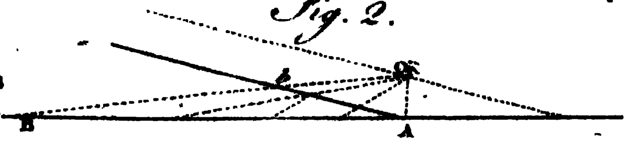


Fig. 3.

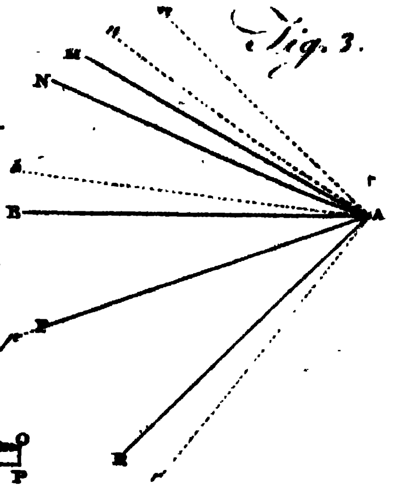


Fig. 4.

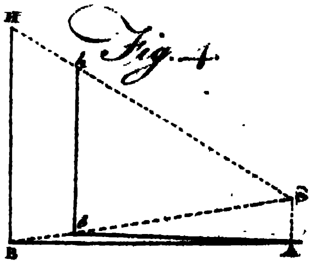


Fig. 5.

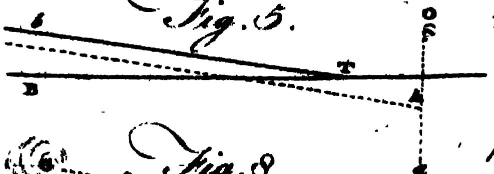


Fig. 8.

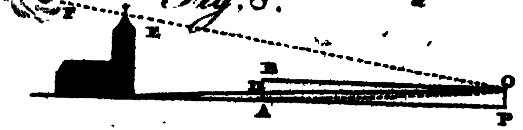


Fig. 6.

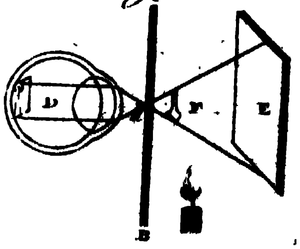


Fig. 7.

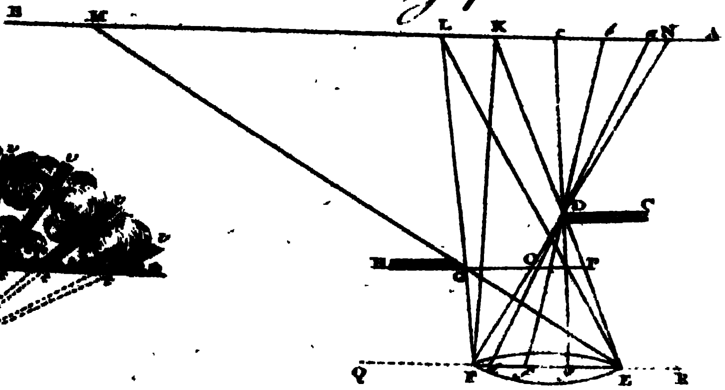


Fig. 12.

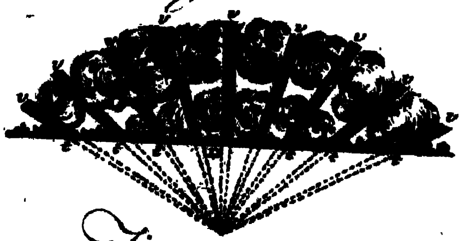


Fig. 10.

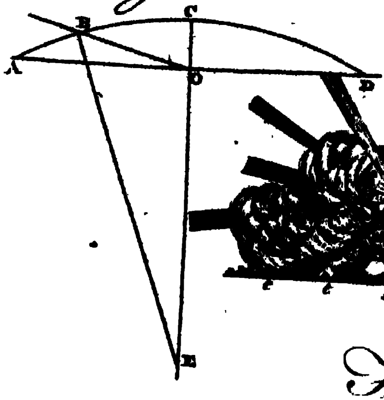


Fig. 11.

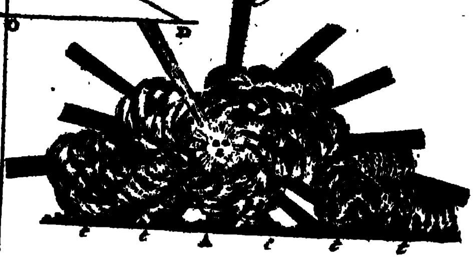


Fig. 9.

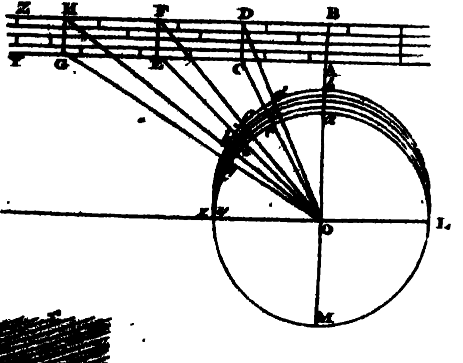


Fig. 14.

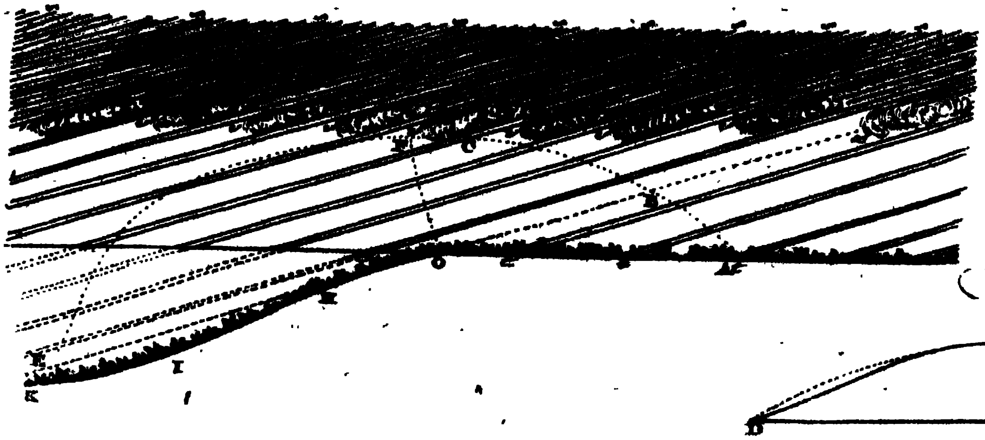
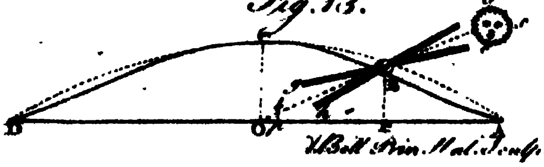


Fig. 13.



A. Bell Prin. Wal. Sculptor fecit.

Illumination of the Shadow of the Earth.

per; becauſe the air is generally quieter in the mornings and evenings than about noon-day; and laſtly, becauſe many ſorts of vapours are exhaled in greater plenty in ſummer than in winter, from many kinds of volatile vegetables; which vapours, when the air is cooled and condenſed in the mornings and evenings, may become denſe enough to reflect a ſenſible light."

§ 7. *Of the Illumination of the Shadow of the Earth by the refraction of the Atmoſphere.*

241 Why the moon is viſible when totally eclipſed.

The ancient philoſophers, who knew nothing of the refractive power of the atmoſphere, were very much perplexed to account for the body of the moon being viſible when totally eclipſed. At ſuch times ſhe generally appears of a dull red colour, like tarniſhed copper, or of iron almoſt red hot. This, they thought, was the moon's native light, by which ſhe became viſible when hid from the brighter light of the ſun. Plutarch indeed, in his diſcourſe upon the face of the moon, attributes this appearance to the light of the fixed ſtars reflected to us by the moon; but this muſt be by far too weak to produce that effect. The true cauſe of it is the ſcattered beams of the ſun bent into the earth's ſhadow by refractions through the atmoſphere in the following manner.

Plate CCCLXII. fig. 1.

" Let the body of the ſun, ſays Dr Smith, be repreſented by the greater circle ab, and that of the earth by the leſſer one cd; and let the lines ace and bde touch them both on their oppoſite ſides, and meet in e beyond the earth; then the angular ſpace ced will repreſent the conic figure of the earth's ſhadow, which would be totally deprived of the ſun's rays, were none of them bent into it by the refractive power of the atmoſphere. Let this power juſt vaniſh at the circle bi, concentric to the earth; ſo that the rays ah and bi, which touch its oppoſite ſides, may proceed unrefracted, and meet each other at k. Then the two neareſt rays to theſe that flow within them, from the ſame points a and b, being refracted inwards through the margin of the atmoſphere, will croſs each other at a point l, ſomewhat nearer to the earth than k; and in like manner, two oppoſite rays next within the two laſt will croſs each other at a point m, ſomewhat nearer to the earth than l, having ſuffered greater refractions, by paſſing through longer and denſer tracts of air lying ſomewhat nearer to the earth. The like approach of the ſucceſſive interſections k, l, m, is to be underſtood of innumerable couples of rays, till you come to the interſection n of the two innermoſt; which we may ſuppoſe juſt to touch the earth at the points o and p. It is plain then, that the ſpace bounded by theſe rays on, np, will be the only part of the earth's ſhadow wholly deprived of the ſun's rays. Let fmg repreſent part of the moon's orbit when it is neareſt to the earth, at a time when the earth's dark ſhadow onp is the longeſt: in this caſe I will ſhow that the ratio of tm to tn is about 4 to 3; and conſequently that the moon, though centrally eclipſed at m, may yet be viſible by means of thoſe ſcattered rays above mentioned, firſt tranſmitted to the moon by refraction through the atmoſphere, and from thence reflected to the earth.

Illumination of the Shadow of the Earth.

Fig. 2.

" For let the incident and emergent parts aq, rn, of the ray $aqorn$, that juſt touches the earth at o, be produced till they meet at u, and let aqu produced meet the axis st produced in x; and joining us and um, ſince the refractions of a horizontal ray paſſing from o to r, or from o to q, would be alike and equal, the external angle nux is double the quantity of the uſual refraction of a horizontal ray; and the angle aus is the apparent meaſure of the ſun's ſemidiameter ſeen from the earth; and the angle ust is that of the earth's ſemidiameter tu ſeen from the ſun (called his *horizontal parallax*); and laſtly, the angle umt is that of the earth's ſemidiameter ſeen from the moon (called her *horizontal parallax*); becauſe the elevation of the point u above the earth is too ſmall to make a ſenſible error in the quantity of theſe angles; whoſe meaſures by aſtronomical tables are as follow:

The ſun's leaſt apparent ſemidiameter = ang. aus = 15—50
The ſun's horizontal parallax - = ang. ust = 00—10

Their difference * is - = ang. txu = 15—40
Double the horizontal refraction = ang. nux = 67—30

Their ſum † is - = ang. tnu = 83—10
The moon's greateſt horizontal parallax = ang. tmu = 62—10

* Eucl. I. Prop. 32.

† id.

Therefore (by a preceding prop.) we have $tm : tn$ :: (ang. tnu : ang. tmu :: $83'—10''$: $62'—10''$ ::) 4 : 3 in round numbers; which was to be proved. It is eaſy to collect from the moon's greateſt horizontal parallax of $62'—10''$, that her leaſt diſtance tm is about $55\frac{1}{3}$ ſemidiameters of the earth; and therefore the greateſt length tn of the dark ſhadow, being three quarters of tm, is about $41\frac{1}{2}$ ſemidiameters.

The difference of the laſt-mentioned angles tnu, tmu, is $mun = 21'$, that is, about two thirds of $31'—40''$, the angle which the whole diameter of the ſun ſubtends at u. Whence it follows, that the middle point m of the moon centrally eclipſed, is illuminated by rays which come from two-thirds of every diame[illegible] of the ſun's diſk, and paſs by one ſide of the earth; and alſo by rays that come from the oppoſite two-thirds of every one of the ſaid diameters, and paſs by the other ſide of the earth. This will appear by conceiving the ray $aqorn$ to be inflexible, and its middle point o to ſlide upon the earth, while the part rn is approaching to touch the point m; for then the oppoſite part qa will trace over two thirds of the ſun's diameter. The true proportion of the angles num, aus, could not be preſerved in the ſcheme, by reaſon of the ſun's immenſe diſtance and magnitude with reſpect to the earth.

Fig. 3.

" Having drawn the line $at\alpha$, it is obſervable, that all the incident rays, as aq, αx, flowing from any one point of the ſun to the circumference of the earth, will be collected to a focus α, whoſe diſtance $t\alpha$ is leſs than tm in the ratio of 62 to 67 nearly; and thus an image of the ſun will be formed at $\alpha\beta$, whoſe rays

Meaſures of Light.

will diverge upon the moon. For the angle $t\alpha u$ is the difference of the angles $xu\alpha$, $u\alpha t$ found above; and $t\alpha$: tm :: ang. tmu : ang. $t\alpha u$ :: 62′—10″ : 67—30″.

“ The rays that flow next above aq and $a\alpha$, by paſſing through a thinner part of the atmoſphere, will be united at a point in the axis $at\alpha$ ſomewhat farther from the earth than the laſt focus α; and the ſame may be ſaid of the rays that paſs next above theſe, and ſo on; whereby an infinite ſeries of images of the ſun will be formed, whoſe diameters and degrees of brightneſs will increaſe with their diſtances from the earth.

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Why the moon appears duller when eclipſed in her perigee than in her apogee.

“ Hence it is manifeſt why the moon eclipſed in her perigee is obſerved to appear always duller and darker than in her apogee. The reaſon why her colour is always of the copper kind, between a dull red and orange, I take to be this: The blue colour of a clear ſky ſhows manifeſtly that the blue-making rays are more copiouſly reflected from pure air than thoſe of any other colour; conſequently they are leſs copiouſly tranſmitted through it among the reſt that come from the ſun, and ſo much the leſs as the tract of air through which they paſs is the longer. Hence the common colour of the ſun and moon is whiteſt in the meridian, and grows gradually more inclined to diluted yellow, orange, and red, as they deſcend lower, that is, as the rays are tranſmitted through a longer tract of air; which tract being ſtill lengthened in paſſing to the moon and back again, cauſes a ſtill greater loſs of the blue-making rays in proportion to the reſt; and ſo the reſulting colour of the tranſmitted rays muſt lie between a dark orange and red, according to Sir Iſaac Newton's rule for finding the reſult of a mixture of colours. We have an inſtance of the reverſe of this caſe in leaf gold, which appears yellow by reflected and blue by tranſmitted rays. The circular edge of the ſhadow in a partial eclipſe appears red; becauſe the red-making rays are the leaſt refracted of all others, and conſequently are left alone in the conical ſurface of the ſhadow, all the reſt being refracted into it.

§ 8. *Of the Meaſures of Light.*

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M. Bouguer's contrivances for meaſuring light.

That ſome luminous bodies give a ſtronger, and others a weaker light, and that ſome reflect more light than others, was always obvious to mankind; but no perſon, before M. Bouguer, hit upon a tolerable method of aſcertaining the proportion that two or more lights bear to one another. The methods he moſt commonly uſed were the following.

Plate CCCLXII.

He took two pieces of wood or paſteboard EC and CD (fig. 4.), in which he made two equal holes P and Q, over which he drew pieces of oiled or white paper. Upon theſe holes he contrived that the light of the different bodies he was comparing ſhould fall; while he placed a third piece of paſteboard FC, ſo as to prevent the two lights from mixing with one another. Then placing himſelf ſometimes on one ſide, and ſometimes on the other, but generally on the oppoſite ſide of this inſtrument, with reſpect to the light, he altered their poſition till the papers in the two holes appeared to be equally enlightened. This being done, he computed the proportion of their light by the ſquares of the diſtances at which the luminous bodies were placed from the objects. If, for inſtance, the diſtances were as three and nine, he concluded that the light they gave were as nine and eighty-one. Where any light was very faint, he ſometimes made uſe of lenſes, in order to condenſe it; and he encloſed them in tubes or not as his particular application of them required.

Meaſures of Light.

To meaſure the intenſity of light proceeding from the heavenly bodies, or reflected from any part of the ſky, he contrived an inſtrument which reſembles a kind of portable camera obſcura. He had two tubes, of which the inner was black, faſtened at their lower extremities by a hinge C, (fig. 5.) At the bottom of theſe tubes were two holes, R and S, three or four lines in diameter, covered with two pieces of fine white paper. The two other extremities had each of them a circular aperture, an inch in diameter; and one of the tubes conſiſted of two, one of them ſliding into the other, which produced the ſame effect as varying the aperture at the end. When this inſtrument is uſed, the obſerver has his head, and the end of the inſtrument C, ſo covered, that no light can fall upon his eye, beſides that which comes through the two holes S and R, while an aſſiſtant manages the inſtrument, and draws out or ſhortens the tube DE, as the obſerver directs. When the two holes appear equally illuminated, the intenſity of the lights is judged to be inverſely as the ſquares of the tubes.

In uſing this inſtrument, it is neceſſary that the object ſhould ſubtend an angle larger than the aperture A or D, ſeen from the other end of the tube; for, otherwiſe, the lengthening of the tube has no effect. To avoid, in this caſe, making the inſtrument of an inconvenient length, or making the aperture D too narrow, he has recourſe to another expedient. He conſtructs an inſtrument, repreſented (fig. 6.), conſiſting of two object-glaſſes, AE and DF, exactly equal, fixed in the ends of two tubes ſix or ſeven feet, or, in ſome caſes, 10 or 12 feet long, and having their foci at the other ends. At the bottom of theſe tubes B, are two holes, three or four lines in diameter, covered with a piece of white paper; and this inſtrument is uſed exactly like the former.

If the two objects to be obſerved by this inſtrument be not equally luminous, the light that iſſues from them muſt be reduced to an equality, by diminiſhing the aperture of one of the object-glaſſes; and then the remaining ſurface of the two glaſſes will give the proportion of their lights. But for this purpoſe, the central parts of the glaſs muſt be covered in the ſame proportion with the parts near the circumference, leaving the aperture ſuch as is repreſented (fig. 7.), becauſe the middle part of the glaſs is thicker and leſs tranſparent than the reſt.

If all the objects to be obſerved lie nearly in the ſame direction, our author obſerves, that theſe two long tubes may be reduced into one, the two object-glaſſes being placed cloſe together, and one eye-glaſs ſufficing for them both. The inſtrument will then be the ſame with that of which he publiſhed an account in 1748, and which he called a *heliometer*, or *aſtrometer*.

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Theſe inſtruments meaſure only the intenſity of light.

Our author obſerves, that it is not the abſolute quantity, but only the intenſity of the light, that is meaſured by theſe two inſtruments, or the number of rays, in proportion to the ſurface of the luminous body; and it is of great importance that theſe two things be

Meaſures of Light.

be diſtinguiſhed. The intenſity of light may be very great, when the quantity, and its power of illuminating other bodies, may be very ſmall, on account of the ſmallneſs of its ſurface; or the contrary may be the caſe, when the ſurface is large.

Having explained theſe methods which M. Bouguer took to meaſure the different proportions of light, we ſhall ſubjoin in this place a few miſcellaneous examples of his application of them.

It is obſervable, that when a perſon ſtands in a place where there is a ſtrong light, he cannot diſtinguiſh objects that are placed in the ſhade; nor can he ſee any thing upon going immediately into a place where there is very little light. It is plain, therefore, that the action of a ſtrong light upon the eye, and alſo the impreſſion which it leaves upon it, makes it inſenſible to the effect of a weaker light. M. Bouguer had the curioſity to endeavour to aſcertain the proportion between the intenſities of the two lights in this caſe; and by throwing the light of two equal candles upon a board, he found that the ſhadow made by intercepting the light of one of them, could not be perceived by his eye, upon the place enlightened by the other, at little more than eight times the diſtance; from whence he concluded, that when one light is eight times eight, or 64 times leſs than another, its preſence or abſence will not be perceived. He allows, however, that the effect may be different on different eyes; and ſuppoſes that the boundaries in this caſe, with reſpect to different perſons, may lie between 60 and 80.

Applying the two tubes of his inſtrument, mentioned above, to meaſure the intenſity of the light reflected from different parts of the ſky; he found that when the ſun was 25 degrees high, the light was four times ſtronger at the diſtance of eight or nine degrees from his body, than it was at 31 or 32 degrees. But what ſtruck him the moſt was to find, that when the ſun is 15 or 20 degrees high, the light decreaſes on the ſame parallel to the horizon to 110 or 120 degrees, and then increaſes again to the place exactly oppoſite to the ſun.

246 Great variation of the light of the moon at different altitudes.

The light of the ſun, out author obſerves, is too ſtrong, and that of the ſtars too weak, to determine the variation of their light at different altitudes: but as, in both caſes, it muſt be in the ſame proportion with the diminution of the light of the moon in the ſame circumſtances, he made his obſervations on that luminary, and found, that its light at 19° 16′, is to its light at 66° 11′, as 1681 to 2500; that is, the one is nearly two thirds of the other. He choſe thoſe particular altitudes, becauſe they are thoſe of the ſun at the two ſolſtices at Croiſic, where he then reſided. When one limb of the moon touched the horizon of the ſea, its light was 2000 times leſs than at the altitude of 66° 11′. But this proportion he acknowledges muſt be ſubject to many variations, the atmoſphere near the earth varying ſo much in its denſity. From this obſervation he concludes, that at a medium light is diminiſhed in the proportion of about 2500 to 1681, in traverſing 7469 toiſes of denſe air.

247 Variation in different parts of the diſks of the ſun and planets.

Laſtly, Our accurate philoſopher applied his inſtrument to the different parts of the ſun's diſk, and found that the centre is conſiderably more luminous than the extremities of it. As near as he could make the obſervation, it was more luminous than a part of the diſk ¾ths of the ſemidiameter from it, in the proportion of 35 to 28; which, as he obſerves, is more than in the proportion of the ſines of the angles of obliquity. On the other hand, he obſerves, that both the primary and ſecondary planets are more luminous at their edges than near their centres.

The compariſon of the light of the ſun and moon is a ſubject that has frequently exerciſed the thoughts of philoſophers; but we find nothing but random conjectures, before our author applied his accurate meaſures in this caſe. In general, the light of the moon is imagined to bear a much greater proportion to that of the ſun than it really does; and not only are the imaginations of the vulgar, but thoſe of philoſophers alſo, impoſed upon with reſpect to it. It was a great ſurpriſe to M. de la Hire to find that he could not, by the help of any burning mirror, collect the beams of the moon in a ſufficient quantity to produce the leaſt ſenſible heat. Other philoſophers have ſince made the like attempts with mirrors of greater power, though without any greater ſucceſs; but this will not ſurpriſe us, when we ſee the reſult of M. Bouguer's obſervations on this ſubject.

248 M. Bouguer's calculation concerning the light of the moon.

In order to ſolve this curious problem concerning the compariſon of the light of the ſun and moon, he compared each of them to that of a candle in a dark room, one in the day-time, and the other in the night following, when the moon was at her mean diſtance from the earth; and, after many trials, he concluded that the light of the ſun is about 300,000 times greater than that of the moon; which is ſuch a diſproportion, that, as he obſerves, it can be no wonder that philoſophers have had ſo little ſucceſs in their attempts to collect the light of the moon with burning glaſſes. For the largeſt of them will not increaſe the light 1000 times; which will ſtill leave the light of the moon, in the focus of the mirror, 300 times leſs than the intenſity of the common light of the ſun.

To this account of the proportion of light which we actually receive from the moon, it cannot be diſpleaſing to the reader, if we compare it with the quantity which would have been tranſmitted to us from that opaque body, if it reflected all the light it receives. Dr Smith thought that he had proved, from two different conſiderations, that the light of the full moon would be to our day-light as 1 to about 90,900, if no rays were loſt at the moon.

249 Dr Smith's calculation.

In the firſt place, he ſuppoſes that the moon enlightened by the ſun, is as luminous as the clouds are at a medium. He therefore ſuppoſed the light of the ſun to be equal to that of a whole hemiſphere of clouds, or as many moons as would cover the ſurface of the heavens. But on this Dr Prieſtley obſerves, that it is true, the light of the ſun ſhining perpendicularly upon any ſurface would be equal to the light reflected from the whole hemiſphere, if every part reflected all the light that fell upon it; but the light that would in fact be received from the whole hemiſphere (part of it being received obliquely) would be only one-half as much as would be received from the whole hemiſphere, if every part of it ſhone directly upon the ſurface to be illuminated.

In his Remarks, par. 97. Dr Smith demonſtrates his method of calculation in the following manner:

Plate CCCLXII. fig. 8.

"Let the little circle *c f d g* repreſent the moon's body half enlightened by the ſun, and the great circle *a e b*, a ſpherical ſhell concentric to the moon, and touching the earth; *a b*, any diameter of that ſhell perpendicular to a great circle of the moon's body, repreſented by its diameter *c d*; *e* the place of the ſhell receiving full moon light from the bright hemiſphere *f d g*. Now, becauſe the ſurface of the moon is rough like that of the earth, we may allow that the ſun's rays, incident upon any ſmall part of it, with any obliquity, are reflected from it every way alike, as if they were emitted. And therefore, if the ſegment *d f* ſhone alone, the points *a*, *e*, would be equally illuminated by it; and likewiſe if the remaining bright ſegment *d g* ſhone alone, the points *b e* would be equally illuminated by it. Conſequently, if the light at the point *a* was increaſed by the light at *b*, it would become equal to the full moon light at *e*. And conceiving the ſame transfer to be made from every point of the hemiſpherical ſurface *h b i k* to their oppoſite points in the hemiſphere *k a e h*, the former hemiſphere would be left quite dark, and the latter would be uniformly illuminated with full moon light; ariſing from a quantity of the ſun's light, which immediately before its incidence on the moon, would uniformly illuminate a circular plane equal to a great circle of her body, called her *diſk*. Therefore the quantities of light being the ſame upon both ſurfaces, the denſity of the ſun's incident light is to the denſity of full moon light, as that hemiſpherical ſurface *h e k* is to the ſaid diſk; that is, as any other hemiſpherical ſurface whoſe centre is at the eye, to that part of it which the moon's diſk appears to poſſeſs very nearly, becauſe it ſubtends but a ſmall angle at the eye: that is, as radius of the hemiſphere to the verſed ſine of the moon's apparent ſemidiameter, or as 10,000,000 to $1106\frac{2}{3}$ or as 90,400 to 1; taking the moon's mean horizontal diameter to be 16′ 7″.

"Strictly ſpeaking, this rule compares moon light at the earth with day light at the moon; the medium of which, at her quadratures, is the ſame as our daylight; but is leſs at her full in the duplicate ratio of 365 to 366, or thereabout, that is, of the ſun's diſtances from the earth and full moon; and therefore full moon light would be to our day light as about 1 to 90,900, if no rays were loſt at the moon.

"Secondly, I ſay that full moon light is to any other moon light as the whole diſk of the moon to the part that appears enlightened, conſidered upon a plane ſurface. For now let the earth be at *b*, and let *d l* be perpendicular to *f g*, and *g m* to *c d*: then it is plain, that *g l* is equal to *d m*; and that *g l* is equal to a perpendicular ſection of the ſun's rays incident upon the arch *d g* which at *b* appears equal to *d m*; the eye being unable to diſtinguiſh the unequal diſtances of its parts. In like manner, conceiving the moon's ſurface to conſiſt of innumerable phyſical circles parallel to *c f d g*, as repreſented at A, the ſame reaſon holds for every one of theſe circles as for *c f d g*. It follows then, that the bright part of the ſurface viſible at *b*, when reduced to a flat as repreſented at B, by the creſcent *p d q m p*, will be equal and ſimilar to a perpendicular ſection of all the rays incident on that part, repreſented at C by the creſcent *pgqlp*. Now the whole diſk being in proportion to this creſcent, as the quantities of light incident upon them; and the light falling upon every rough particle, being equally rarefied in diverging to the eye at *b*, conſidered as equidiſtant from them all; it follows, that full moon light is to this moon light as the whole diſk *p d q c* to the creſcent *p d q m p*.

Fig. 9.

"Therefore, by compounding this ratio with that in the former remark, day light is to moon light as the ſurface of an hemiſphere whoſe centre is at the eye, to the part of that ſurface which appears to be poſſeſſed by the enlightened part of the moon."

250 Mr Michell's calculation.

Mr Michell made his computation in a much more ſimple and eaſy manner, and in which there is much leſs danger of falling into any miſtake. Conſidering the diſtance of the moon from the ſun, and that the denſity of the light muſt decreaſe in the proportion of the ſquare of that diſtance, he calculated the denſity of the ſun's light, at that diſtance, in proportion to its denſity at the ſurface of the ſun; and in this manner he found, that if the moon reflected all the light it receives from the ſun, it would only be the 45,000th part of the light we receive from the greater luminary. Admitting, therefore, that moon light is only a 300,000th part of the light of the ſun, Mr Michell concludes, that it reflects no more than between the 6th and 7th part of what falls upon it.

SECT. IV. *Of Aberration.*

251 Theory of aberration.

THE great practical uſe of the ſcience of optics is to aid human ſight; but it has been repeatedly obſerved during the progreſs of this article, that in conſtructing dioptrical inſtruments for this purpoſe, great difficulties ariſe from the aberration of light. It has been ſhown, page 288, &c. how to determine the concourſe of any refracted ray PF′ with the ray RVCF′ (figs. 5, 6, &c. Plate CCCLV.) which paſſes through the centre C, and therefore falls perpendicularly on the ſpherical ſurface at the vertex V, and ſuffers no refraction. This is the conjugate focus to R for the two rays RP, RV, and for another ray flowing from R and falling on the ſurface at an equal diſtance on the oppoſite ſide to P. In ſhort, it is the conjugate focus for all the rays flowing from R and falling on the ſpherical ſurface in the circumference of a circle deſcribed by the revolution of the point P round the axis RVCF′; that is, of all the rays which occupy the conical ſurface deſcribed by the revolution of RP, and the refracted rays occupy the conical ſurface produced by the revolution of PF′.

But no other rays flowing from R are collected at F′; for it appeared in the demonſtration of that propoſition, that rays incident at a greater diſtance from the axis RC were collected at a point between C and F′; and then the rays which are incident on the whole arch PC, or the ſpherical ſurface generated by its revolution round RC, although they all croſs the axis RC, are diffuſed over a certain portion of it, by what has been called the aberration of figure. It is called alſo (but improperly) the aberration from the geometrical focus, by which is meant the focus of an infinitely ſlender pencil of rays, of which the middle ray (or axis of the pencil) occupies the lens RC, and ſuffers

Fig. 1.

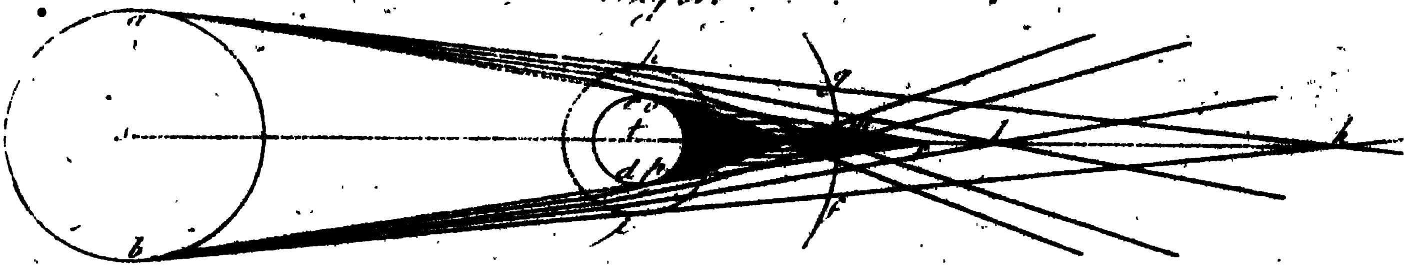


Fig. 2.

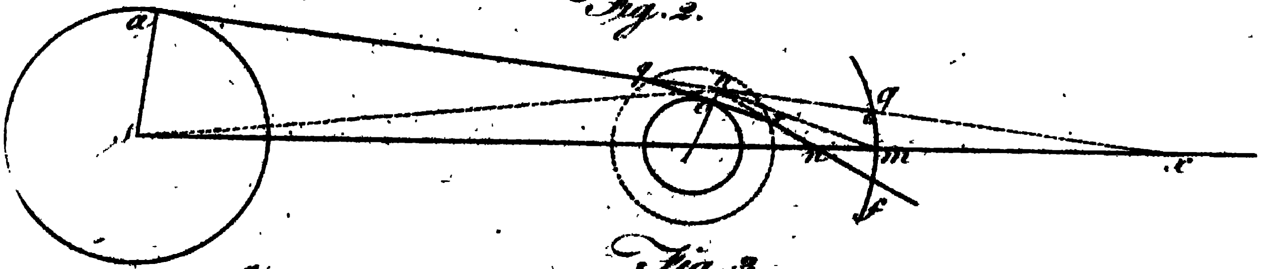


Fig. 3.

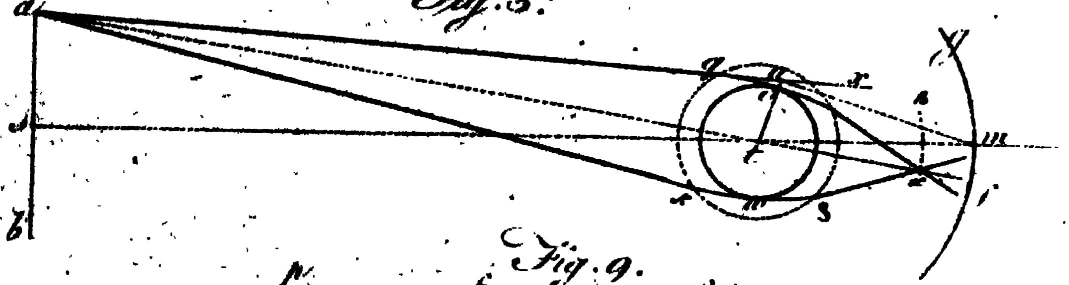


Fig. 4.

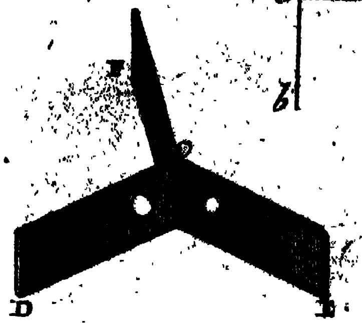


Fig. 9.

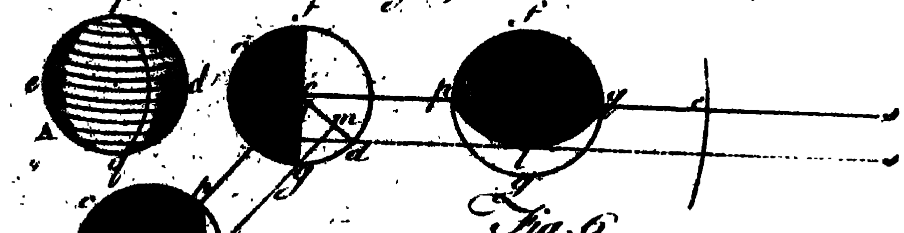


Fig. 6.

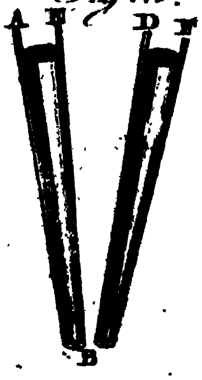


Fig. 5.

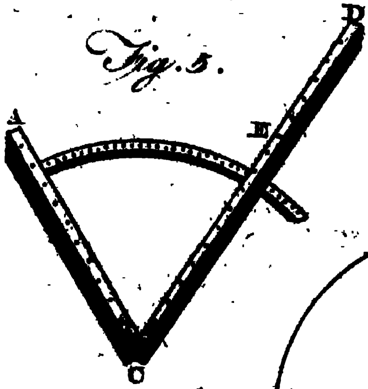


Fig. 8.

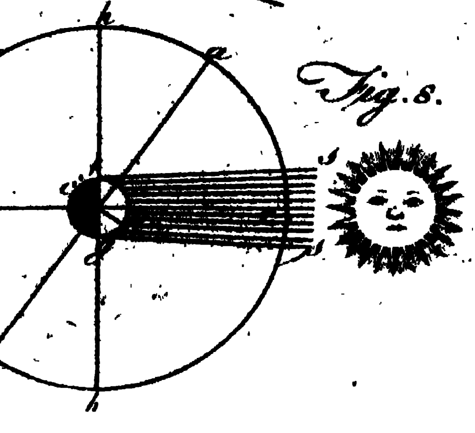
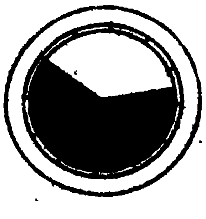


Fig. 7.



A. Bell Prin. Wall Engraver fecit

Of Aberration

ſuffers no refraction. But there is no ſuch focus. But if we make $m\mathrm{RV}-n\mathrm{RC} : m\mathrm{RV}=\mathrm{VC} : \mathrm{VF}$, the point F is called the geometrical focus, and is the remoteſt limit from C of all the foci (equally geometrical) of rays flowing from R. The other limit is eaſily determined by conſtructing the problem for the extreme point of the given arch.

It is evident from the conſtruction, that while the point of incidence P is near to V, the line CK increaſes but very little, and therefore CF diminiſhes little, and the refracted rays are but little diffuſed from F; and therefore they are much denſer in its vicinity than any other point of the axis. It will ſoon be evident that they are incomparably denſer. It is on this account that the point F has been called the conjugate focus *κατ' ἐξοχην*, to R, and the geometrical focus and the diffuſion has been called *aberration*. A geometrical point R is thus repreſented by a very ſmall circle (or phyſical point as it is improperly called) at F, and F has drawn the chief attention. And as, in the performance of optical inſtruments, it is neceſſary that this extended repreſentation of a mathematical point R be very ſmall, that it may not ſenſibly interfere with the repreſentations of the points adjacent to R, and thus cauſe indiſtinct viſion, a limit is thus ſet to the extent of the refracting ſurface, which muſt be employed to produce this repreſentation. But this evidently diminiſhes the quantity of light, and renders the viſion *obſcure* though diſtinct. Artiſts have therefore endeavoured to execute refracting ſurfaces of forms not ſpherical, which collect accurately to one point the light iſſuing from another, and the mathematicians have furniſhed them with forms having this property; but their attempts have been fruitleſs. Spherical ſurfaces are the only ones which can be executed with accuracy. All are done by grinding the refracting ſubſtance in a mould of proper materials. When this is ſpherical, the two work themſelves, with moderate attention, into an exact ſphere; becauſe if any part is more prominent than another, it is ground away, and the whole gets of neceſſity one curvature. And it is aſtoniſhing to what degree of accuracy this is done. An error of the millionth part of an inch would totally deſtroy the figure of a mirror of an inch focal diſtance, ſo as to make it uſeleſs for the coarſeſt inſtrument. Therefore all attempts to make other figures are given up. Indeed other reaſons make them worſe than ſpherical, even when accurately executed. They would not collect to accurate foci the rays of oblique pencils.

It is evident from theſe obſervations, that the theory of aberrations is abſolutely neceſſary for the ſucceſsful conſtruction of optical inſtruments; and it muſt be acceptable to the reader to have a ſhort account of it in this place. Enough ſhall be ſaid here to ſhow the *general* nature and effects of it in optical inſtruments, and in ſome of the more curious phenomena of nature. Under the article TELESCOPE the ſubject will be reſumed, in ſuch a manner as to enable the reader who poſſeſſes a very moderate ſhare of mathematical knowledge, not only to underſtand how aberrations are increaſed and diminiſhed, but alſo how, by a proper employment of contrary aberrations, their hurtful effects may be *almoſt entirely* removed in all important caſes: And the manner in which the ſubject ſhall be treated in the preſent general ſketch, will have the advantage of pointing out at the ſame time the maxims of conſtruction of the greateſt part of optical inſtruments, which generally produce their effects by means of pencils of rays which are either out of the axis altogether, or are oblique to it; caſes which are ſeldom conſidered in elementary treatiſes of optics.

Of Aberration.

Plate CCCLXIII

Let PVπ (fig. 1.) be a ſpherical ſurface of a refracting ſubſtance (glaſs for inſtance), of which C is the centre, and let an indefinitely ſlender pencil of rays APap be incident on it, in a direction parallel to a ray CV paſſing through the centre. It is required to determine the focus f of this pencil.

252 How to remedy the evils of aberration.

Let AP be refracted into PF. Draw CI, CR the ſines of incidence and refraction, and CP the radius. Draw RB perpendicular to CP, and Bf parallel to AP or CV. I ſay, firſt, f is the focus of the indefinitely ſlender pencil, or, more accurately ſpeaking, f is the remoteſt limit from P of the concourſe of rays with PF' refracted by points lying without the arch VP, or the neareſt limit for rays incident between V and P.

Draw the radius Cpc', the line pf; and draw pg parallel to Pf, and Po perpendicular to Pf. It is evident, that if f be the focus, $c'pf$ is the angle of refraction correſponding to the angle of incidence, apC as C'Pf is the angle correſponding to APC. Alſo PCp is the increment of the angle of incidence, and the angle $c'pg$ is equal to the ſum of the angle C'Pf and C'Cc, and the angle gpf is equal to the angle pfP. Therefore $c'pf=\mathrm{C'P}f+\mathrm{P,C}p,+\mathrm{P}fp$. Therefore $\mathrm{PC}p+\mathrm{P}fp$ is the correſponding increment of the angle of refraction. Alſo, becauſe $\mathrm{RP}o=\mathrm{CP}p$ (being right angles) the angle $p\mathrm{P}o=\mathrm{RPC}$, and $\mathrm{P}o : \mathrm{P}p= \mathrm{PR} : \mathrm{PC}$.

Page 280, &c.

Therefore by a preceding Lemma in this article, we have $\mathrm{PC}p+\mathrm{P}fp : \mathrm{PC}p=$ tan. ref. : tan. incid. $=$ T, R : T, I; and $\mathrm{P}fp : \mathrm{PC}p=$ T, R—T, I : T, I, $=$ diff. : T, I; but $\mathrm{P}fp : \mathrm{PC}p=\frac{\mathrm{P}o}{\mathrm{P}f} : \frac{\mathrm{P}p}{\mathrm{P}c}=\frac{\mathrm{PR}}{\mathrm{P}f} : \frac{\mathrm{PC}}{\mathrm{PC}}, =\mathrm{PR} : \mathrm{P}f, =$ DR DB (becauſe DP is parallel to Bf by conſtruction) $=$ tan. CPR—tan. CPI : tan. CPI. Now CPI is the angle of incidence; and therefore CPR is the angle properly correſponding to it as an angle of refraction, and the point f is properly determined.

Hence the following rule. As the difference of the tangents of incidence and refraction is to the tangent of incidence, ſo is the radius of the ſurface multiplied by the coſine of refraction to the diſtance of the focus of an infinitely ſlender pencil of parallel incident rays.

N. B. We here conſider the coſine of refraction as a number. This was firſt done by the celebrated Leonhard Euler, and is one of the greateſt improvements in mathematics which this century can boaſt of. The ſines, tangents, ſecants, &c. are conſidered as fractional numbers, of which the radius is unity. Thus, CP $\times$ ſin. 30°, is the ſame thing with $\frac{1}{2}$CP, or $\frac{\mathrm{CP}}{2}$. And in like manner, CB, drawn perpendicular to the axis $\times$ ſin. 19° 28′ 16′ 32″, is the ſame thing with $\frac{1}{3}$ of CB. Alſo $\frac{\mathrm{CB}}{\text{coſ. } 60^\circ}$ is the ſame thing with twice CB, &c.

Of Aberration.

In this manner, BE = BC × ſin. BCE, and alſo BE = CE × tan. BCE, and CB = CE × ſec. BCE, &c. &c. This manner of conſidering the lines which occur in geometrical conſtructions is of immenſe uſe in all parts of mixed mathematics; and nowhere more remarkably than in optics, the moſt beautiful example of them. Of this an important inſtance ſhall now be given.

Corol. 1. The diſtance *f* G of this lateral focus from the axis CV (that is, from the line drawn through the centre parallel to the incident light) is proportional to the cube of the ſemi-aperture PH of the ſpherical ſurface.

For *f* G = BE. Now BE = CB × ſin. BCE, = CB × ſin. CPA; and CB = RC × coſ. RCB, = RC × ſin. CPR, and RC = CP × ſin. CPR: Therefore BE = PC × ſin.^{2} CPR × ſin. PCA, = PC × ſin.^{2} refr. × ſin. incid. but ſin.^{2} refr. $= \frac{m^2}{n^2}$ ſin.^{2} incid. Therefore, finally, BE, or *f* G = PC × $\frac{m^2}{n^2}$ × ſin.^{3} incid.: But PC. ſin. incid. is evidently PH the ſemi-aperture; therefore the propoſition is manifeſt.

Corol. 2. Now let this ſlender pencil of rays be incident at the vertex V. The focus will now be a point F in the axis, determined by making $CV : CF = m - n : m$. Let the incident pencil gradually recede from the axis CF, ſtill, however, keeping parallel to it. The focus *f* will always be found in a curve line DC'F, ſo conſtituted that the ordinate G will be as the cube of the line PH, perpendicular to the axis intercepted between the axis and that point of the ſurface which is cut by a tangent to the curve in *f*.

All the refracted rays will be tangents to this curve, and the adjacent rays will croſs each other in theſe lateral foci *f*; and will therefore be incomparably more denſe along the curve than anywhere within its area. This is finely illuſtrated by receiving on white paper the light of the ſun refracted through a globe or cylinder of glaſs filled with water. If the paper is held parallel to the axis of the cylinder, and cloſe to it, the illuminated part will be bounded by two very bright parallel lines, where it is cut by the curve; and theſe lines will gradually approach each other as the paper is withdrawn from the veſſel, till they coaleſce into one very bright line at F, or near it. If the paper be held with its end touching the veſſel, and its plane nearly perpendicular to the axis, the whole progreſs at the curve will be diſtinctly ſeen.

As ſuch globes were uſed for burning glaſſes, the point of greateſt condenſation (which is very near but not exactly in F) was called the *focus*. When theſe curves were obſerved by Mr Tchirnhauſs, he called them *cauſtics*; and thoſe formed by refraction he called *diacauſtics*, to diſtinguiſh them from the *catacauſtics* formed by reflection.

It is ſomewhat ſurpriſing, that theſe curves have been ſo little ſtudied ſince the time of Tchirnhauſs. The doctrine of aberrations has indeed been conſidered in a manner independent on their properties. But whoever conſiders the progreſs of rays in the eye-piece of optical inſtruments, will ſee that the knowledge of the properties of diacauſtic curves determines directly, and almoſt accurately, the foci and images that are formed there. For, let the object-glaſs of a teleſcope or microſcope be of any dimenſions, the pencils incident on the eye-glaſſes are almoſt all of this evaneſcent bulk. Theſe advantages will be ſhown in their proper places: and we proceed at preſent to extend our knowledge of aberrations in general, firſt conſidering the aberrations of parallel incident rays.

Of Aberration.

Abiding by the inſtance repreſented by the figure, it is evident that the cauſtic will touch the ſurface in a point φ, ſo ſituated that $c\varphi : \varphi\chi = m : n$. The refracted ray $\varphi\Phi$ will touch the ſurface, and will croſs the axis in Φ, the neareſt limit of diffuſion along the axis. If the ſurface is of ſmaller extent, as PV, the cauſtic begins at *f*, when the extreme refracted ray P *f* touches the cauſtic, and croſſes the axis in F', and the oppoſite branch of the cauſtic in K. If there be drawn an ordinate KO *k* to the cauſtic, it is evident that the whole light incident on the ſurface PVΠ paſſes through the circle whoſe diameter is K *k*, and that the circle is the ſmalleſt ſpace which receives *all* the refracted light.

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How light is diſtributed over the ſmalleſt circle of diffuſion.

It is of great importance to conſider the manner in which the light is diſtributed over the ſurface of this circle of ſmalleſt diffuſion: for this is the repreſentation of one point of the infinitely diſtant radiant object. Each point of a planet, for inſtance, is repreſented by this little circle; and as the circles repreſenting the different adjacent points muſt interfere with each other, an indiſtinctneſs muſt ariſe, ſimilar to what is obſerved when we view an object through a pair of ſpectacles, which do not fit the eye. The indiſtinctneſs muſt be in proportion to the number of points whoſe circles of diffuſion interfere; that is, to the area of theſe circles, provided that the light is uniformly diffuſed over them: but if it be very rare at the circumference, the impreſſion made by the circles belonging to the adjacent points muſt be leſs ſenſible. Accordingly, Sir Iſaac Newton, ſuppoſing it incomparably rarer at the circumference than towards the centre, affirms, that the indiſtinctneſs of teleſcopes ariſing from the ſpherical figure of the object-glaſs was ſome thouſand times leſs than that ariſing from the unequal refrangibility of light; and therefore, that the attempts to improve them by diminiſhing or removing this aberration were needleſs, while the diſtinctneſs from unequal refrangibility remained. It is ſurpriſing, that a philoſopher ſo eminent for ſagacity and for mathematical knowledge ſhould have made ſuch a miſtake, and unfortunate that the authority of his great name hindered others from examining the matter, truſting to his aſſertion, that the light was ſo rare at the border of this circle. His miſtake is ſurpriſing, becauſe the very nature of a cauſtic ſhould have ſhowed him, that the light was infinitely denſe at the borders of the circle of ſmalleſt diffuſion. The firſt perſon who detected this overſight of the Britiſh philoſopher was the Abbé Boſcovich, who, in a diſſertation publiſhed at Vienna in 1767, ſhowed, by a very beautiful analyſis, that the diſtribution was extremely different from what Newton had aſſerted, and that the ſuperior indiſtinctneſs ariſing from unequal refrangibility was incomparably leſs than he had ſaid. We ſhall attempt to make this delicate and intereſting matter conceivable by thoſe who have but ſmall mathematical preparation.

Plate CCCLXIII.

Let the curve DVZCI *c z v d* (fig. 2.) be the cauſtic (magnified), EI its axis, I the focus of central rays, B the focus of extreme rays, and IB the line containing in the foci of all the intermediate rays, and COc the diameter of the circle of ſmalleſt diffuſion.

It is plain, that from the centre O there can be drawn two rays OV, Ov, touching the cauſtic in V, v. Therefore the point O will receive the ray EO, which paſſes through the vertex of the refracting ſurface, and all the rays which are incident on the circumference of a circle deſcribed on the refracting ſurface by the extremity of the ray OV, or Ov. The denſity of the light at O will therefore be indefinitely great.

From the point C there can be drawn two rays; one of them CX touching the cauſtic in C, and the other C, touching it at d on the oppoſite ſide. The rays which touch the cauſtic in the immediate vicinity of Cy, both in the arch CV and the arch CI will cut OC in points indefinitely near to each other; becauſe their diſtance from each other in the line OC will be to their uniform diſtance on the refracting ſurface as the diſtance between their points of contact with the cauſtic to the diſtance of theſe points from the refracting ſurface. Here therefore at C the denſity of the light will alſo be indefinitely great.

From any point H, lying between O and C, may be drawn three rays. One of them LHT, P, touching the arch CD of the cauſtic in T, cutting the refracting ſurface in P, and the axis in L: another, tHp, touching the arch CI of the cauſtic in t. The third is $H\tau\pi$, touching the arch $c\,d$ of the oppoſite branch of the cauſtic in τ.

Plate CCCLXIII.

It will greatly aſſiſt our conceptions of this ſubject, if we conſider a ray of light from the refracting ſurface as a thread attached at I of this figure, or at F of fig. 1. and gradually unlapped from the cauſtic DVCI on one ſide, and then lapped on the oppoſite branch I $c\,v\,d$; and attend to the point of its interſection with the diameter cOC of the circle of ſmalleſt diffuſion.

Therefore, 1. Let the ray be firſt ſuppoſed to paſs through the refracting ſurface at F, the right hand extremity of the aperture. The thread is then folded up on the whole right hand branch ICVD of the cauſtic; and if the ſtraight part of it FD be produced, it will cut the diameter of the circle of ſmalleſt diffuſion in the oppoſite extremity c. Or ſuppoſe a ruler in place of the thread, applied to the cauſtic at D and to the refracting ſurface at F, the part of it Dc, which is detached from the cauſtic, cuts COc in the point c. 2. Now ſuppoſe the ruler to revolve gradually, its extremity moving acroſs the arch FAf of the refracting ſurface while the edge is applied to the cauſtic; the point of contact with the cauſtic will ſhift gradually down the branch DV of the cauſtic, while its edge paſſes acroſs the line cC; and when the point of contact arrives at V, the extremity will be at Y on the refracting ſurface, and the interſection of the edge will be at O. 3. Continuing the motion, the point of contact ſhifts from V to Z, the extremity from Y to Q', and the interſection from O to Q, ſo that $OQ^2=\frac{OC^2}{2}$, as will preſently appear. 4. After this, the point of contact will ſhift from Z to C, the extremity from Q' to X, halfway from F to A, as will ſoon be ſhown, and the interſection from Q to C. 5. The point of contact will now ſhift from C down to I, the extremity will paſs from X to A, and the interſection will go back from C to O. 6. The ruler muſt now be applied to the other branch of the cauſtic I $c\,z\,v\,d$, and the point of contact will aſcend from I to c, the extremity will paſs from A to x, half way to f from A, and the interſection from O to c. 7. The point of contact will aſcend from C to z, the extremity paſſes from x to q', and the interſection from C to q, Oq^2 being $=\frac{Oc^2}{2}$. 8. While the contact of the ruler and cauſtic ſhifts from z to v, the extremity ſhifts from q' to y, and the interſection from q to O. 9. The contact riſes from v to d, the extremity paſſes from y to f, and the interſection from O to C; and then the motion acroſs the refracting ſurface is completed, the point of contact ſhifting down from D to I along the branch DVZCI, and then aſcending along the other branch I $c\,z\,v\,d$, while the interſection paſſes from c to C, back again from C to c, and then back again from c to C, where it ends, having thrice paſſed through every intermediate point of cC.

254 Denſity of light.

We may form a notion of the denſity of the light in any point H, by ſuppoſing the incident light of uniform denſity at the refracting ſurface, and attending to the conſtipation of the rays in the circle of ſmalleſt diffuſion. Their vicinity may be eſtimated both in the direction of the radii OH, and in the direction of the circumference deſcribed by its extremity H, during its revolution round the axis; and the denſity muſt be conceived as proportional to the *number* of originally equidiſtant rays, which are collected into a ſpot of given area. Theſe have been collected from a correſponding ſpot or area of the refracting ſurface; and as the number of rays is the ſame in both, the denſity at H will be to the denſity of the refracting ſurface, as the area occupied of the refracting ſurface to the correſponding area at H. The vicinity of the rays in the direction of the radius depends on the proportion between PT and TH. For the ray adjacent to PTH may be ſuppoſed to croſs it at the point of contact T; and therefore the uniform diſtance between them at the ſurface of that medium is to the diſtance between the ſame rays at H as the diſtance of T from the refracting ſurface to its diſtance from H. Therefore the number of rays which occupy a tenth of an inch, for example, of the radius AP, is to the number which would occupy a tenth of an inch at H as TH to TP; and the radial denſity at P is to the radial denſity at H, alſo as TH to TP. In the next place, The circumferential denſity at P is to that at H as the radius AP to the radius OH. For ſuppoſing the figure to turn round its axis AI, the point P of the refracting ſurface will deſcribe a circumference whoſe radius is AP, and H will deſcribe a circumference whoſe radius is OH; and the whole rays which paſs through the firſt circumference paſs alſo through the laſt, and therefore their circumferential denſities will be in the inverſe proportion of the ſpaces into which they are collected. Now the radius AP is to the radius OH as AL to OL; and circumferences have the ſame proportion with their radii. Therefore the circumferential denſity at P is to that in H as AL to OL inverſely; and it was found that the radial denſity was as AN to ON inverſely, being as TH to TP, which are very nearly in this ratio. Therefore the abſolute denſity (or number of rays collected in a given ſpace) at P will be to that at H, in the ratio compounded of theſe ratios; that is, in the ratio of ON × OL to AN × AL. But as NL bears but a very ſmall ratio to AN or AL,

$AN \times AL$ may be taken as equal to AO^2 without any ſenſible error. It never differs from it in teleſcopes 100th part, and is generally incomparably ſmaller. Therefore the denſity at H may be conſidered as proportional to $ON \times OL$ inverſely. And it will afterwards appear that NS is $=3oL$. Therefore the denſity at H is inverſely as $ON \times NS$.

Now deſcribe a circle on the diameter OS, and draw $NT\varphi$ cutting the circumference $N\varphi^2 = ON \times NS$, and the denſity at H is as $N\varphi^2$ inverſely. This gives us a very eaſy eſtimation of the denſity, viz. draw a line from the point of contact of the ray which touches the part VC of the cauſtic, and the denſity is in the inverſe ſubduplicate ratio of the part of this line intercepted between the axis and the circumference $S\varphi O$. It will afterwards appear that the denſity correſponding to this ray is one half of the denſity correſponding to all the three: or a better expreſſion will be had for the denſity at H by drawing $R\beta$ perpendicular to $R\varphi$, and βo perpendicular to $\varphi\beta$, making φR in o; then φo is as $\frac{1}{\varphi N^2}$, or is proportional to the denſity, as is evident.

When H is at O, N is at S, and φo is infinite. As H moves from O, N deſcends, and φo diminiſhes, till H comes to Q, and T to z, and φ to ζ, and o to R. When H moves from Q towards C, T deſcends below z, φo again increaſes, till it is again infinite, when H is at C, T at C, and N at O.

Thus it appears, without any minute conſideration, that the light has a denſity indefinitely great in the centre O; that the denſity decreaſes to a minimum in ſome intermediate point Q, and then increaſes again to infinity at the margin C. Hence it follows, that the indiſtinctneſs ariſing from the ſpherical figure of the refracting ſurfaces is incomparably greater than Newton ſuppoſed; and that the valuable diſcovery of Mr Dollond of achromatic lenſes, muſt have failed of anſwering his fond expectations, if his very method of producing them had not, at the ſame time, enabled him to remove that other indiſtinctneſs by employing contrary aberrations. And now, ſince the diſcoveries by Dr Blair of ſubſtances which diſperſe the different colours in the ſame proportions, but very different degrees, has enabled us to employ much larger portions of the ſphere than Mr Dollond could introduce into his object-glaſſes, it becomes abſolutely neceſſary to ſtudy this matter completely, in order to diſcover and aſcertain the amount of the errors which perhaps unavoidably remain.

255 Contrary aberrations correct each other. This ſlight ſketch of the moſt ſimple caſe of aberration, namely, when the incident rays are parallel, will ſerve to give a general notion of the ſubject; and the reader can now ſee how contrary aberrations may be employed in order to form an ultimate image which ſhall be as diſtinct as poſſible. For let it be propoſed to converge parallel rays accurately to the focus F (Plate CCCLXIII fig. 3.) by the refraction of ſpherical ſurfaces of which V is the vertex. Let PV be a convex lens of ſuch a form that rays flowing from F and paſſing through it immediately round the vertex V are collected to the conjugate focus R, while the extreme ray FP, incident on the margin of the lens P, is converged to r, nearer to V, having the longitudinal aberration Rr. Let pV be a plano-concave lens, of ſuch ſphericity that a ray Ap, parallel to the axis CV, and incident on the point p, as far from its vertex V as P in the other lens is from its vertex, is diſperſed from r, the diſtance ρV being equal to rV, while the central rays are diſperſed from P, as far from V as R is from V. It is evident, that if theſe lenſes be joined as in fig. 4. a ray A'p, parallel to the common axis CV, will be collected at the diſtance VF equal to VF in the fig. 4 and that rays paſſing through both lenſes in the neighbourhood of the axis will be collected at the ſame point F.

This compound lens is ſaid to be without ſpherical aberration; and it is true that the central and the extreme rays are collected in the ſame point F: but the rays which fall on the lens between the centre and margin are a little diffuſed from F, and it is not poſſible to collect them all to one point. For in the rules for computing the aberration, quantities are neglected which do not preſerve (in different apertures) the ſame ratio to the quantities retained. The diffuſion is leaſt when the aberration is corrected, not for the very extremity, but for a certain intermediate point (varying with the aperture, and having no known ratio to it); and when this is done the compound lens is in its ſtate of greateſt perfection, and the remaining aberration is quite inſenſible.

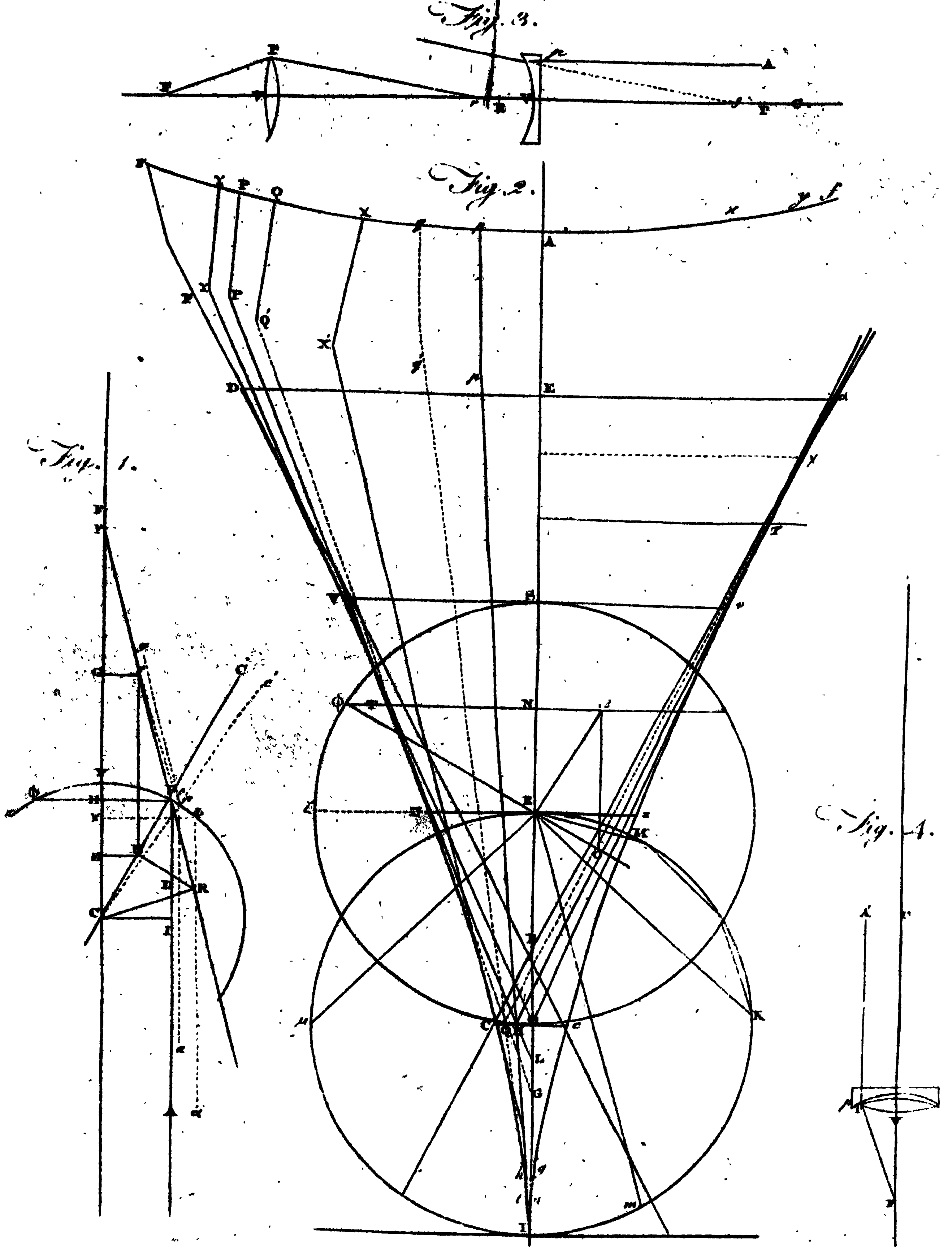
This ſubject will be reſumed under the article Teleſcope, and proſecuted as far as the conſtruction of optical inſtruments requires.

Sect. IV. *Of Optical Inſtruments.*

Of the mechaniſm of optical inſtruments, particular accounts are given in this work under their reſpective denominations. Theſe it would be improper to repeat; but as it belongs to the ſcience of optics to explain, by the laws of refraction and reflection, the ſeveral phenomena which thoſe inſtruments exhibit, we muſt in this place enumerate the inſtruments themſelves, omitting entirely, or ſtating very briefly, ſuch facts as are ſtated at large in other places. In this enumeration we ſhall begin with the *multiplying glaſs*, not becauſe it is firſt in importance, but that it may not intervene between inſtruments more uſeful, and which have a mutual relation to one another.

§ 1. *The Multiplying Glaſs.*

256 Phænomena of the multiplying gl The multiplying glaſs is made by grinding down the round ſide bik (Plate CCCLXIV fig. 1.) of a plano-convex glaſs AB, into ſeveral flat ſurfaces, as bb, bld, dk. An object C will not appear magnified when ſeen through this glaſs by the eye at H; but it will appear multiplied into as many different objects as the glaſs contains plane ſurfaces. For, ſince rays will flow from the object C to all parts of the glaſs, and each plane ſurface will refract theſe rays to the eye, the ſame object will appear to the eye in the direction of the rays which enter it through each ſurface. Thus, a ray giH, falling perpendicularly on the middle ſurface, will go through the glaſs to the eye without ſuffering any refraction; and will therefore ſhow the object in its true place at C: whilſt a ray ab flowing from the ſame object, and falling obliquely on the plane ſurface bb, will be refracted in the direction be, by paſſing through the glaſs; and, upon leaving it, will go on to the eye in the direction eH; which will cauſe



A.Bell Prin. Wal. Sculptor fecit.

cauſe the ſame object C to appear alſo at E, in the direction of the ray H *e*, produced in the right line H *e n*. And the ray *c d*, flowing from the object C, and falling obliquely on the plane ſurface *d k*, will be refracted (by paſſing through the glaſs, and leaving it at *f*) to the eye at H; which will cauſe the ſame object to appear at D, in the direction H *f m*.—If the glaſs be turned round the line *g l* H, as an axis, the object C will keep its place, becauſe the ſurface *b l d* is not removed; but all the other objects will ſeem to go round C, becauſe the oblique planes, on which the rays *abcd* fall, will go round by the turning of the glaſs.

§ 2. *Mirrors*.

It has been elſewhere obſerved, that of mirrors there are three principally uſed in optical experiments (See CATOPTRICS, Sect. I.); the plane mirror, the ſpherical convex mirror, and the ſpherical concave mirror. Of theſe the plane mirror firſt claims our attention, as it is more common, and undoubtedly more ancient, than the other two. It has been ſaid (*ubi ſupra*), that the image reflected by this mirror appears as far behind the ſurface as the object is before it; that the image will appear of the ſame ſize and in the ſame poſition with the object; that every ſuch mirror will reflect an image of twice its own length and breadth; and that in certain circumſtances it will reflect ſeveral images of the ſame object. For theſe phenomena it is our buſineſs in this place to account by the laws of reflection.

Plate CCLXIV.

Let AB (fig. 2.) be an object placed before the reflecting ſurface *g h i* of the plane mirror CD; and let the eye be at *o*. Let A*h* be a ray of light flowing from the top A of the object, and falling upon the mirror at *h*, and *hm* be a perpendicular to the ſurface of the mirror at *h*; the ray A*h* will be reflected from the mirror to the eye at *o*, making an angle *mho* equal to the angle A*hm*: then will the top of the image E appear to the eye in the direction of the reflected ray *oh* produced to E, where the right line A*p*E, from the top of the object, cuts the right line *oh*E, at E. Let B*i* be a ray of light proceeding from the foot of the object at B to the mirror at *i*; and *ni* a perpendicular to the mirror from the point *i*, where the ray B *i* falls upon it; this ray will be reflected in the line *io*, making an angle *nio* equal to the angle B*in*, with that perpendicular, and entering the eye at *o*; then will the foot F of the image appear in the direction of the reflected ray *oi*, produced to F, where the right line BF cuts the reflected ray produced to F. All the other rays that flow from the intermediate points of the object AB, and fall upon the mirror between *h* and *i*, will be reflected to the eye at *o*; and all the intermediate points of the image EF will appear to the eye in the direction of theſe reflected rays produced. But all the rays that flow from the object and fall upon the mirror above *h*, will be reflected back above the eye at *o*; and all the rays that flow from the object, and fall upon the mirror below *i*, will be reflected back below the eye at *o*; ſo that none of the rays that fall above *h*, or below *i*, can be reflected to the eye at *o*; and the diſtance between *h* and *i* is equal to half the length of the object AB.

Hence it appears, that if a man ſees his whole image in a plane looking-glaſs, the part of the glaſs that reflects his image muſt be juſt half as long and half as broad as himſelf, let him ſtand at any diſtance from it whatever; and that his image muſt appear juſt as far behind the glaſs as he is before it. Thus, the man AB (fig. 3.) viewing himſelf in the plane mirror CD, which is juſt half as long as himſelf, ſees his whole image as at EF, behind the glaſs, exactly equal to his own ſize. For a ray AC proceeding from his eye at A, and falling perpendicularly upon the ſurface of the glaſs at C, is reflected back to his eye, in the ſame line CA; and the eye of his image will appear at E, in the ſame line produced to E, beyond the glaſs. And a ray BD, flowing from his foot, and falling obliquely on the glaſs at D, will be reflected as obliquely on the other ſide of the perpendicular *ab*D, in the direction DA; and the foot of his image will appear at F, in the direction of the reflected ray AD, produced to F, where it is cut by the right line BGF, drawn parallel to the right line ACE. Juſt the ſame as if the glaſs were taken away, and the real man ſtood at F, equal in ſize to the man ſtanding at B: for to his eye at A, the eye of the other man at E would be ſeen in the direction of the line ACE; and the foot of the man at F would be ſeen by the eye A, in the direction of the line ADF.

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Size of a looking-glaſs in which a man may ſee his whole image.

If the glaſs be brought nearer the man AB, as ſuppoſe to *cb*, he will ſee his image as at CDG: for the reflected ray CA (being perpendicular to the glaſs) will ſhow the eye of the image as at C; and the incident ray B*b*, being reflected in the line *b*A, will ſhow the foot of his image as at G; the angle of reflection *ab*A being always equal to the angle of incidence B*ba*: and ſo of all the intermediate rays from A to B. Hence, if the man AB advances towards the glaſs CD, his image will approach towards it; and if he recedes from the glaſs, his image will alſo recede from it.

If the object be placed before a common looking-glaſs, and viewed obliquely, three, four, or more images of it, will appear behind the glaſs.

Plate CCCLIX.

To explain this, let ABCD (fig. 11.) repreſent the glaſs; and let EF be the axis of a pencil of rays flowing from E, a point in an object ſituated there. The rays of this pencil will in part be reflected at F, ſuppoſe into the line FG. What remains will (after refraction at F, which we do not conſider here) paſs on to H; from whence (on account of the quickſilver which is ſpread over the ſecond ſurface of glaſſes of this kind to prevent any of the rays from being tranſmitted there) they will be ſtrongly reflected to K, where part of them will emerge and enter an eye at L. By this means one repreſentation of the ſaid point will be formed in the line LK produced, ſuppoſe in M: Again, Another pencil, whoſe axis is EN, firſt reflected at N, then at O, and afterwards at P, will form a ſecond repreſentation of the ſame point at Q: And, thirdly, Another pencil, whoſe axis is ER, after reflection at the ſeveral points R, S, H, T, V, ſucceſſively, will exhibit a third repreſentation of the ſame point at X; and ſo on *in infinitum*. The ſame being true of each point in the object, the whole will be repreſented in the like manner; but the repreſentations will be faint, in proportion to the number of reflections the rays ſuffer, and the length of their progreſs within the glaſs.

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Why three or four images of objects are ſeen in plane mirrors.

glaſs. We may add to theſe another repreſentation of the ſame object in the line LO produced, made by ſuch of the rays as fall upon O, and are from thence reflected to the eye at L.

This experiment may be tried by placing a candle before the glaſs as at E, and viewing it obliquely, as from L.

2. *Of Concave and Convex Mirrors.* The effects of theſe in magnifying and diminiſhing objects have been already in general explained; but for the better underſtanding the nature of reflecting teleſcopes, it will ſtill be proper to ſubjoin the following particular deſcription of the effects of concave ones.

Plate CCCLXIV.

When parallel rays (fig. 4.), as *dfa*, C*mb*, *elc*, fall upon a concave mirror AB (which is not tranſparent, but has only the ſurface A*b*B of a clear poliſh, they will be reflected back from that mirror, and meet in a point *m*, at half the diſtance of the ſurface of the mirror from C the centre of its concavity; for they will be reflected at as great an angle from a perpendicular to the ſurface of the mirror, as they fell upon it with regard to that perpendicular, but on the other ſide thereof. Thus, let C be the centre of concavity of the mirror A*b*B; and let the parallel rays *dfa*, C*mb*, and *elc*, fall upon it at the points *a*, *b*, and *c*. Draw the lines C*ia*, C*mb*, and C*bc*, from the centre C to theſe points; and all theſe lines will be perpendicular to the ſurface of the mirror, becauſe they proceed thereto like ſo many radii or ſpokes from its centre. Make the angle C*ab* equal to the angle *da*C, and draw the line *amb*, which will be the direction of the ray *dfa*, after it is reflected from the point *a* of the mirror; ſo that the angle of incidence *da*C is equal to the angle of reflection C*ab*; the rays making equal angles with the perpendicular C*ia* on its oppoſite ſides.

Draw alſo the perpendicular C*bc* to the point *c*, where the ray *elc* touches the mirror; and having made the angle C*ci* equal to the angle C*ce*, draw the line *cmi*, which will be the courſe of the ray *elc*, after it is reflected from the mirror.

The ray C*mb* paſſing through the centre of concavity of the mirror, and falling upon it at *b*, is perpendicular to it; and is therefore reflected back from it in the ſame line *bm*C.

All theſe reflected rays meet in the point *m*; and in that point the image of the body which emits the parallel rays *da*, C*b*, and *ec*, will be formed; which point is diſtant from the mirror equal to half the radius *bm*C of its concavity.

The rays which proceed from any celeſtial object may be eſteemed parallel at the earth; and therefore the image of that object will be formed at *m*, when the reflecting ſurface of the concave mirror is turned directly towards the object. Hence, the focus *m* of parallel rays is not in the centre of the mirror's concavity, but half way between the mirror and that centre.

The rays which proceed from any remote terreſtrial object are nearly parallel at the mirror: not ſtrictly ſo, but come diverging to it, in ſeparate pencils, or as it were bundles of rays, from each point of the ſide of the object next the mirror; and therefore they will not be converged to a point at the diſtance of half the radius of the mirror's concavity from its reflecting ſurface, but into ſeparate points at a little greater diſtance from the mirror. And the nearer the object is to the mirror, the farther theſe points will be from it; and an inverted image of the object will be formed in them, which will ſeem to hang pendant in the air; and will be ſeen by an eye placed beyond it (with regard to the mirror) in all reſpects like the object, and as diſtinct as the object itſelf.

259 Aerial images formed by concave mirrors.

Let A*c*B (fig. 5.) be the reflecting ſurface of a mirror, whoſe centre of concavity is at C; and let the upright object DE be placed beyond the centre C, and ſend out a conical pencil of diverging rays from its upper extremity D, to every point of the concave ſurface of the mirror A*c*B. But to avoid confuſion, we only draw three rays of that pencil, as DA, D*c*, DB.

From the centre of concavity C, draw the three right lines CA, C*c*, CB, touching the mirror in the ſame points where the foreſaid rays touch it; and all theſe lines will be perpendicular to the ſurface of the mirror. Make the angle CA*d* equal to the angle DAC, and draw the right line A*d* for the courſe of the reflected ray DA: make the angle C*cd* equal to the angle D*c*C, and draw the right line *cd* for the courſe of the reflected ray D*d*: make alſo the angle CB*d* equal to the angle DBC, and draw the right line B*d* for the courſe of the reflected ray DB. All theſe reflected rays will meet in the point *d*, where they will form the extremity *d* of the inverted image *ed* ſimilar to the extremity D of the upright object DE.

If the pencil of rays E*f*, E*g*, E*h*, be alſo continued to the mirror, and their angles of reflection from it be made equal to their angles of incidence upon it, as in the former pencil from D, they will all meet in the point *e* by reflection, and form the extremity *e* of the image *ed*, ſimilar to the extremity E of the object DE.

And as each intermediate point of the object, between D and E, ſends out a pencil of rays in like manner to every part of the mirror, the rays of each pencil will be reflected back from it, and meet in all the intermediate points between the extremities *e* and *d* of the image; and ſo the whole image will be formed, not at *i*, half the diſtance of the mirror from its centre of concavity C, but at a greater diſtance between *i* and the object DE; and the image will be inverted with reſpect to the object.

This being well underſtood, the reader will eaſily ſee how the image is formed by the large concave mirror of the reflecting teleſcope, when he comes to the deſcription of that inſtrument.

When the object is more remote from the mirror than its centre of concavity C, the image will be leſs than the object, and between the object and mirror: when the object is nearer than the centre of concavity, the image will be more remote and bigger than the object. Thus, if ED be the object, *de* will be its image: For, as the object recedes from the mirror, the image approaches nearer to it; and as the object approaches nearer to the mirror, the image recedes farther from it; on account of the leſſer or greater divergency of the pencils of rays which proceed from the object: for the leſs they diverge, the ſooner they are converged to points by reflection; and the more they diverge, the farther they muſt be reflected before they meet.

If the radius of the mirror's concavity, and the diſtance of the object from it, be known, the diſtance of the image from the mirror is found by this rule: Divide the product of the diſtance and radius by double the diſtance made leſs by the radius, and the quotient is the diſtance required.

If the object be in the centre of the mirror's concavity, the image and object will be coincident, and equal in bulk.

If a man places himſelf directly before a large concave mirror, but farther from it than its centre of concavity, he will ſee an inverted image of himſelf in the air, between him and the mirror, of a leſs ſize than himſelf. And if he holds out his hand towards the mirror, the hand of the image will come out towards his hand, and coincide with it, of an equal bulk, when his hand is in the centre of concavity; and he will imagine he may ſhake hands with his image. If he reaches his hand farther, the hand of the image will paſs by his hand, and come between his hand and his body: and if he moves his hand towards either ſide, the hand of the image will move towards the other; ſo that whatever way the object moves, the image will move the contrary.

All the while a byſtander will ſee nothing of the image, becauſe none of the reflected rays that form it enter his eyes.

§ 3. *Microſcopes.*

Under the word MICROSCOPE a copious detail has been given of the conſtruction of thoſe inſtruments as they are now made by the moſt eminent artiſts. In that article it fell not within our plan to treat ſcientifically of their magnifying powers: theſe can be explained only by the laws of refraction and reflection, which we ſhall therefore apply to a few microſcopes, leaving our readers to make the application themſelves to ſuch others as they may chooſe to analyze by optical principles.

The firſt and ſimpleſt of all microſcopes is nothing more than a very ſmall globule of glaſs, or a convex lens whoſe focal diſtance is extremely ſhort. The magnifying power of this microſcope is thus aſcertained by Dr Smith. "A minute object *pq*, ſeen diſtinctly through a ſmall glaſs AE by the eye put cloſe to it, appears ſo much greater than it would to the naked eye, placed at the leaſt diſtance *q* L from whence it appears ſufficiently diſtinct, as this latter diſtance *q*L is greater than the former *q*E. For having put your eye cloſe to the glaſs EA, in order to ſee as much of the object as poſſible at one view, remove the object *pq* to and fro till it appear moſt diſtinctly, ſuppoſe at the diſtance E*q*. Then conceiving the glaſs AE to be removed, and a thin plate, with a pin-hole in it, to be put in its place, the object will appear diſtinct and as large as before, when ſeen through the glaſs, only not ſo bright. And in this latter caſe it appears ſo much greater than it does to the naked eye at the diſtance *q*L, either with a pin-hole or without it, as the angle *p*E*q* is greater than the angle *p*L*q*, or as the latter diſtance *q*L is greater than the former *q*E. Since the interpoſition of the glaſs has no other effect than to render the appearance diſtinct, by helping the eye to increaſe the refraction of the rays in each pencil, it is plain that the greater apparent magnitude is entirely owing to a nearer view than could be taken by the naked eye. As the human eye is ſo conſtructed, as, for reaſons already aſſigned, to have diſtinct viſion only when the rays which fall upon it are parallel or nearly ſo; it follows that if the eye be ſo perfect as to ſee diſtinctly by pencils of parallel rays falling upon it, the diſtance E*q*, of the object from the glaſs, is then the focal diſtance of the glaſs. Now, if the glaſs be a ſmall round globule, of about $\frac{1}{15}$th of an inch diameter, its focal diſtance E*q*, being three quarters of its diameter, is $\frac{1}{20}$th of an inch; and if *q*L be eight inches, the diſtance at which we uſually view minute objects, this globule will magnify in the proportion of 8 to $\frac{1}{20}$, or of 160 to 1.

Plate CCCLXIV figs. 6, 7.

2. *The Double or Compound Microſcope*, (fig. 8.) conſiſts of an object-glaſs *c d*, and an eye-glaſs *e f*. The ſmall object *a b* is placed at a little greater diſtance from the glaſs *c d* than its principal focus; ſo that the pencils of rays flowing from the different points of the object, and paſſing through the glaſs, may be made to converge, and unite in as many points between *g* and *h*, where the image of the object will be formed; which image is viewed by the eye through the eye-glaſs *e f*. For the eye-glaſs being ſo placed, that the image *g h* may be in its focus, and the eye much about the ſame diſtance on the other ſide, the rays of each pencil will be parallel after going out of the eye-glaſs, as at *e* and *f*, till they come to the eye at *k*, where they will begin to converge by the refractive power of the humours; and after having croſſed each other in the pupil, and paſſed through the cryſtalline and vitreous humours, they will be collected into points on the retina, and form the large inverted image AB thereon.

260 Uſe of ſeveral lenſes in a compound microſcope.

By this combination of lenſes, the aberration of the light from the figure of the glaſs, which in a globule of the kind above-mentioned is very conſiderable, is in ſome meaſure corrected. This appeared ſo ſenſibly to be the caſe, even to former opticians, that they very ſoon began to make the addition of another lens. The inſtrument, however, receives a conſiderable improvement by the addition of a third lens. For, ſays Mr Martin, it is not only evident from the theory of this aberration, that the image of any point is rendered leſs confuſed by refraction thro' two lenſes than by an equal refraction through one; but it alſo follows, from the ſame principle, that the ſame point has its image ſtill leſs confuſed when formed by rays refracted through three lenſes than by an equal refraction through two; and therefore a third lens added to the other two will contribute to make the image more diſtinct, and conſequently the inſtrument more complete. At the ſame time the field of view is amplified, and the uſe of the microſcope rendered more agreeable, by the addition of the other lens. Thus alſo we may allow a ſomewhat larger aperture to the object lens, and thereby increaſe the brightneſs of objects, and greatly heighten the pleaſure of viewing them. For the ſame reaſon, Mr Martin has propoſed a four-glaſs microſcope, which anſwers the purpoſes of magnifying and of diſtinct viſion ſtill more perfectly.

The magnifying power of double microſcopes is ea-

Plate CCLXIV. Fig. 9.

ſily underſtood, thus: The glaſs L next the object PQ is very ſmall, and very much convex, and conſequently its focal diſtance LF is very ſhort; the diſtance LQ of the ſmall object PQ is but a little greater than LF: Greater it muſt be, that the rays flowing from the object may converge after paſſing through the glaſs, and croſſing one another, form an image of the object; and it muſt be but a little greater, that the image pq may be at a great diſtance from the glaſs, and conſequently may be much larger than the object itſelf. This picture pq being viewed through a convex glaſs AE, whoſe focal diſtance is q E, appears diſtinct as in a teleſcope. Now the object appears magnified upon two accounts; firſt, becauſe, if we viewed its picture pq with the naked eye, it would appear as much greater than the object, at the ſame diſtance, as it really is greater than the object, or as much as Lq is greater than LQ; and ſecondly, becauſe this picture appears magnified through the eye-glaſs as much as the leaſt diſtance at which it can be ſeen diſtinctly with the naked eye, is greater than q E, the focal diſtance of the eye-glaſs. For example, if this latter ratio be five to one, and the former ratio of Lq to LQ be 20 to 1; then, upon both accounts, the object will appear 5 times 20, or 100 times greater than to the naked eye.

Fig. 10. repreſents the ſection of a compound microſcope with three lenſes. By the middle one GK the pencils of rays coming from the object-glaſs are refracted ſo as to tend to a focus at O; but being intercepted by the proper eye-glaſs DF, they are brought together at I, which is nearer to that lens than its proper focus at L; ſo that the angle DIF, under which the object now appears, is larger than DLF, under which it would have appeared without this additional glaſs; and conſequently the object is more magnified in the ſame proportion. Dr Hooke tells us, that, in moſt of his obſervations, he made uſe of a double microſcope with this broad middle glaſs when he wanted to ſee much of an object at one view, and taking it out when he would examine the ſmall parts of an object more accurately; for the fewer refractions there are, the more bright and clear the object appears.

261 The magnifying power of Dr Smith's microſcope.

Having in the hiſtorical part of this article given a practical account of the conſtruction of Dr Smith's double reflecting microſcope, it may not be improper in this place to aſcertain its magnifying power. This we ſhall do from the author himſelf, becauſe his ſymbols, being general, are applicable to ſuch microſcopes of all dimenſions; and though the mere practical reader may perhaps be at firſt ſight puzzled by them, yet, if he will ſubſtitute any particular numbers for m and n, &c. he may aſcertain with eaſe the magnifying power of ſuch a microſcope of thoſe particular dimenſions.

Fig. 11.

Between the centre E and principal focus T of a concave ſpeculum ABC, whoſe axis is EQTC, place an object PQ; and let the rays flowing from it be reflected from the ſpeculum AB towards an image pq; but before they unite in it, let them be received by a convex ſpeculum abc, and thence be reflected, through a hole BC in the vertex of the concave, to a ſecond image wx, to be viewed through an eye-glaſs l.

The object may be ſituated between the ſpecula C, c; or, which is better, between the principal focus t and vertex c of the convex one, a ſmall hole being made in its vertex for the incident rays to paſs through.

In both caſes we have TQ, TE, Tq, continual proportionals in ſome given ratio, ſuppoſe of 1 to n; and alſo tq, tc, tx, continual proportionals in ſome other given ratio, ſuppoſe of 1 to m. Then if d be the uſual diſtance at which we view minute objects diſtinctly with the naked eye, and xl the focal diſtance of the leaſt eye-glaſs, through which the object appears ſufficiently bright and diſtinct, it will be magnified in the ratio of mnd to xl.

For the object PQ, and its firſt image pq, are terminated on one ſide by the common axis of the ſpecula, and on the other by a line PEp, drawn through the centre E of the concave ABC. Likewiſe the images pq and wx are terminated by the common axis and by the line epw, drawn through the centre e of the convex abc *. Hence, by the ſimilar triangles wxe, pqe, and alſo pqE, PQE, we have $wx : pq :: xe : qe :: m : 1$, and $pq : PQ :: q E : QE :: n : 1$; and conſequently $wx : PQ :: mn : 1$, whence $wx = mn \times PQ$. Now if lx be the focal diſtance of the eye-glaſs l, the points P, Q, of the object, are ſeen through it by the rays of two pencils emerging parallel to the lines wl xl reſpectively; that is, PQ appears under an angle equal to wlx, which is as $\frac{wx}{xl} = \frac{mnPQ}{xl}$; and to the naked eye at the diſtance d from PQ, it appears under an angle PoQ which is as $\frac{PQ}{d}$, and therefore is magnified in the ratio of theſe angles, that is, of mnd to xl.

* Eucl. v. 12.

Corol. Having the numbers m, n, d, to find an eye-glaſs which ſhall cauſe the microſcope to magnify M times in diameter, take $xl = \frac{mnd}{M}$. For the apparent magnitude is to the true as $M : 1 :: mnd : xl$.

262 An eaſy method of aſcertaining the magnifying power of the moſt common microſcopes.

We ſhall conclude this part of our ſubject with the following eaſy method of aſcertaining the magnifying power of ſuch microſcopes as are moſt in uſe.

The apparent magnitude of any object, as muſt appear from what hath been already delivered, is meaſured by the angle under which it is ſeen; and this angle is greater or ſmaller according as the object is near to or far from the eye; and of conſequence the leſs the diſtance at which it can be viewed the larger it will appear. The naked eye is unable to diſtinguiſh any object brought exceedingly near it: but looking through a convex lens, however near the focus of that lens be, there an object may be diſtinctly ſeen; and the ſmaller the lens is, the nearer will be its focus, and in the ſame proportion the greater will be its magnifying power. From theſe principles it is eaſy to find the reaſon why the firſt or greateſt magnifiers are ſo extremely minute; and alſo to calculate the magnifying power of any convex lens employed in a ſingle microſcope: For as the proportion of the natural ſight is to the focus, ſuch will be its power of magnifying. If the focus of a convex lens, for inſtance, be at one inch, and the natural ſight at eight inches, which is the common ſtandard, an object may be ſeen through that lens at one inch diſtance from the eye, and will appear in its diameter eight times larger than it does to the naked eye; but as the object is magnified every way, in length as well as in breadth, we muſt ſquare this diameter to know how much it really is enlarged; and we then find that its ſuperficies is magnified 64 times.

263 Further obſervations on the magnifying power of microſcopes.

Again, Suppoſe a convex lens whoſe focus is only one-tenth of an inch diſtant from its centre; as in eight inches, the common diſtance of diſtinct viſion with the naked eye, there are 80 ſuch tenths, an object may be ſeen through this glaſs 80 times nearer than with the naked eye. It will, of conſequence, appear 80 times longer, and as much broader, than it does to common ſight; and therefore is 6400 times magnified. If a convex glaſs be ſo ſmall that its focus is only $\frac{1}{20}$ of an inch diſtant, we find that eight inches contain 160 of theſe twentieth parts; and of conſequence the length and breadth of any object ſeen through ſuch a lens will be magnified 160 times, and the whole ſurface 25,600 times. As it is an eaſy matter to melt a drop or globule of a much ſmaller diameter than a lens can be ground; and as the focus of a globule is no farther off than a quarter of its own diameter, it muſt of conſequence magnify to a prodigious degree. But this exceſſive magnifying power is much more than counterbalanced by its admitting ſo little light, want of diſtinctneſs, and ſhowing ſuch a minute part of the object to be examined; for which reaſon, theſe globules, though greatly in vogue ſome time ago, are now almoſt entirely rejected. Mr Leeuwenhoek, as has been already obſerved, made uſe only of ſingle microſcopes conſiſting of convex lenſes, and left to the Royal Society a legacy of 26 of thoſe glaſſes. According to Mr Folkes's deſcription of theſe, they were all exceedingly clear, and ſhowed the object very bright and diſtinct; "which (ſays Mr Folkes), muſt be owing to the great care this gentleman took in the choice of his glaſs, his exactneſs in giving it the true figure, and afterwards, among many, reſerving only ſuch for his uſe as upon trial he found to be moſt excellent. Their powers of magnifying are different, as different objects may require: and as on the one hand, being all ground glaſſes, none of them are ſo ſmall, or conſequently magniſy to ſo great a degree, as ſome of thoſe drops frequently uſed in other microſcopes; yet, on the other hand, the diſtinctneſs of theſe very much exceeds what I have met with in glaſſes of that ſort. And this was what Mr Leeuwenhoek ever propoſed to himſelf; rejecting all thoſe degrees of magnifying in which he could not ſo well obtain that end. For he informs us in one of his letters, that though he had above 40 years by him glaſſes of an extraordinary ſmallneſs, he had made but very little uſe of them; as having found, in a long courſe of experience, that the moſt conſiderable diſcoveries were to be made with ſuch glaſſes as, magnifying but moderately, exhibited the object with the greateſt brightneſs and diſtinction."

In a ſingle microſcope, if you want to learn the magnifying power of any glaſs, no more is neceſſary than to bring it to its true focus, the exact place whereof will be known by an object's appearing perfectly diſtinct and ſharp when placed there. Then, with a pair of ſmall compaſſes, meaſure, as nearly as you can, the diſtance from the centre of the glaſs to the object you was viewing, and afterwards applying the compaſſes to any ruler, with a diagonal ſcale of the parts of an inch marked on it, you will eaſily find how many parts of an inch the ſaid diſtance is. When that is known, compute how many times thoſe parts of an inch are contained in eight inches, the common ſtandard of ſight, and that will give you the number of times the diameter is magnified; ſquaring the diameter will give the ſuperficies; and, if you would learn the ſolid contents, it will be ſhown by multiplying the ſuperficies by the diameter.

The ſuperficies of one ſide of an object only can be ſeen at one view; and to compute how much that is magnified, is moſt commonly ſufficient: but ſometimes it is ſatisfactory to know how many minute objects are contained in a larger; as ſuppoſe we deſire to know how many animalcules are contained in the bulk of a grain of ſand: and to anſwer this, the cube, as well as the ſurface, muſt be taken into the account. For the greater ſatisfaction of thoſe who are not much verſed in theſe matters, we ſhall here ſubjoin the following

TABLE of the MAGNIFYING POWERS of CONVEX GLASSES, employed in *Single Microſcopes*, according to the diſtance of their focus: Calculated by the ſcale of an inch divided into 100 parts. Showing how many times the DIAMETER, the SUPERFICIES, and the CUBE of an OBJECCT, is magnified, when viewed through ſuch glaſſes, to an eye whoſe natural ſight is at eight inches, or 800 of the 100dth parts of an inch.

			Magnifies the Diameter.	Magnifies the Superficies.	Magnifies the Cube of an Object.	
The focus of a glaſs at	$\frac{1}{2}$, or 50	hundredth parts of an inch	16	256	4,096	Times.
	$\frac{4}{10}$, or 40		20	400	8,000	
	$\frac{3}{10}$, or 30		26	676	17,576	
	$\frac{1}{5}$, or 20		40	1,600	64,000	
	15		53	2,809	148,877	
	14		57	3,249	185,193	
	13		61	3,721	226,981	
	12		66	4,356	287,496	
	11		72	5,184	373,240	
	$\frac{1}{10}$ or 10		80	6,400	512,000	
	9		88	7,744	6[illegible]1,472	
	8		100	10,000	1,000,000	
	7		114	12,996	1,481,544	
	6		133	17,689	2,352,637	
	$\frac{1}{20}$, or 5		160	25,600	4,096,000	
	4		200	40,000	8,000,000	
	3		266	70,756	18,821,096	
	$\frac{1}{50}$, or 2		400	160,000	64,000,000	
	1		800	640,000	512,000,000	

The greateſt magnifier in Mr Leeuwenhoek's cabinet of microſcopes, preſented to the Royal Society, has its focus, as nearly as can well be meaſured, at one-twentieth of an inch diſtance from its centre; and conſequently magnifies the diameter of an object 160 times, and the ſuperficies 25,600. But the greateſt magnifier in Mr Wilſon's ſingle microſcopes, as they are now made, has uſually its focus at no farther diſtance than about the 50th part of an inch; whereby it has a power of enlarging the diameter of an object 400, and its ſuperficies 160,000 times.

264 The magnifying wer of calcu different from that of others.

The magnifying power of the ſolar microſcope muſt be calculated in a different manner; for here the difference between the focus of the magnifier and the diſtance of the ſcreen or ſheet whereon the image of the object is caſt, is the proportion of its being magnified. [illegible]poſe, for inſtance, the lens made uſe of has its foſtanc[illegible]alf an inch, and the ſcreen is placed at the diſied in t[illegible]e feet, the object will then appear magnias in five feet [illegible]rtion of five feet to half an inch: and will be magnified 1 are 120 half inches, the diameter times; and, by puttin[illegible]es, and the ſuperficies 14,400 you may magnify the obje[illegible] [illegible]een at farther diſtances, pleaſe: but Mr Baker adviſes almoſt as much as you more than bigneſs, and to re[illegible] diſtinctneſs that diſtance where the object is ſeen moſt diſtin[illegible] clear. place the ſcreen juſt at

With regard to the double reflecting microſcope, Mr Baker obſerves, that the power of the object-lens is indeed greatly increaſed by the addition of two eye-glaſſes; but as no object-lens can be uſed with them of ſo minute a diameter, or which magnifies of itſelf near ſo much as thoſe that can be uſed alone, the glaſſes of this microſcope, upon the whole, magnify little or nothing more than thoſe of Mr Wilſon's ſingle one; the chief advantage ariſing from a combination of lenſes being the ſight of a larger field or portion of an object magnified in the ſame degree.

§ 4. *Teleſcopes.*

I. The REFRACTING TELESCOPE.

265 Nature of the aſtronomical teleſcope.

After what has been ſaid concerning the ſtructure of the compound microſcope, and the manner in which the rays paſs through it to the eye, the nature of the common aſtronomical teleſcope will eaſily be underſtood: for it differs from the microſcope only in that the object is placed at ſo great a diſtance from it, that the rays of the ſame pencil, flowing from thence, may be conſidered as falling parallel to one another upon the object-glaſs; and therefore the image made by that glaſs is looked upon as coincident with its focus of parallel rays.

Plate CCCLXIV.

1. This will appear very plain from the 12th figure, in which AB is the object emitting the ſeveral pencils of rays A *c d*, B *c d*, &c. but ſuppoſed to be at ſo great a diſtance from the object-glaſs, *c d*, that the rays of the ſame pencil may be conſidered as parallel to each other; they are therefore ſuppoſed to be collected into their reſpective foci at the [illegible] ſituated at the focal diſt[illegible] the object-glaſs *c d*. Here [illegible] image E, and croſſing each other proceed diverging to the eye-glaſs *h g*; which being placed at its own focal diſtance from the points *m* and *p*, the rays of each pencil, after paſſing through that glaſs, will become parallel among themſelves; but the pencils themſelves will converge conſiderably with reſpect to one another, even ſo as to croſs at *e*, very little farther from the glaſs *g h* than its focus; becauſe, when they entered the glaſs, their axes were almoſt parallel, as coming through the object-glaſs at the point *k*, to

whoſe diſtance the breadth of the eye-glaſs in a long teleſcope bears very ſmall proportion. So that the place of the eye will be nearly at the focal diſtance of the eye-glaſs, and the rays of each reſpective pencil being parallel among themſelves, and their axes croſſing each other in a larger angle than they would do if the object were to be ſeen by the naked eye, viſion will be diſtinct, and the object will appear magnified.

266 Magnifying power of. The power of magnifying in this teleſcope is as the focal length of the object-glaſs to the focal length of the eye-glaſs.

Dem. In order to prove this, we may conſider the angle A*k*B as that under which the object would be ſeen by the naked eye; for in conſidering the diſtance of the object, the length of the teleſcope may be omitted, as bearing no proportion to it. Now the angle under which the object is ſeen by means of the teleſcope is *g e h*, which is to the other A*k*B, or its equal *g k h*, as the diſtance from the centre of the object-glaſs to that of the eye-glaſs. The angle, therefore, under which an object appears to an eye aſſiſted by a teleſcope of this kind, is to that under which it would be ſeen without it, as the focal length of the object-glaſs to the focal length of the eye-glaſs.

It is evident from the figure, that the viſible area, or ſpace which can be ſeen at one view when we look through this teleſcope, depends on the breadth of the eye-glaſs, and not of the object-glaſs; for if the eye-glaſs be too ſmall to receive the rays *g m*, *p h*, the extremities of the object could not have been ſeen at all: a larger breadth of the object-glaſs conduces only to the rendering each point of the image more luminous by receiving a larger pencil of rays from each point of the object.

267 Objects ſeen through, inverted. It is in this teleſcope as in the compound microſcope, where we ſee, when we look through it, not the object itſelf, but only an image of it at CED: now that image being inverted with reſpect to the object, as it is, becauſe the axes of the pencils that flow from the object croſs each other at *k*, objects ſeen through a teleſcope of this kind neceſſarily appear inverted.

This is a circumſtance not at all regarded by aſtronomers: but for viewing objects upon the earth, it is convenient that the teleſcope ſhould repreſent them in their natural poſture; to which uſe the teleſcope with three eye-glaſſes, as repreſented fig. 13. is peculiarly adapted, and the progreſs of the rays through it from the object to the eye is as follows: Plate CCCLXIV.

268 Common refracting teleſcope ſhows objects erect. AB is the object ſending out the ſeveral pencils A*c d*, B*c d*, &c. which paſſing through the object-glaſs *c d*, are collected into their reſpective foci in CD, where they form an inverted image. From hence they proceed to the firſt eye-glaſs *e f*, whoſe focus being at *l*, the rays of each pencil are rendered parallel among themſelves, and their axes, which were nearly parallel before, are made to converge and croſs each other: the ſecond eye-glaſs *g h*, being ſo placed that its focus ſhall fall upon *m*, renders the axes of the pencils which diverge from thence parallel, and cauſes the rays of each, which were parallel among themſelves, to meet again at its focus EF on the other ſide, where they form a ſecond image inverted with reſpect to the former, but erect with reſpect to the object. Now this image being ſeen by the eye at *a b* through the eye-glaſs *i k*, affords a direct repreſentation of the object, and under the ſame angle that the firſt image CD would have appeared, had the eye been placed at *l*, ſuppoſing the eye-glaſſes to be of equal convexity; and therefore the object is ſeen equally magnified in this as in the former teleſcope, that is, as the focal diſtance of the object-glaſs to that of any one of the eye-glaſſes, and appears erect.

If a teleſcope exceeds 20 feet, it is of no uſe in viewing objects upon the ſurface of the earth; for if it magnifies above 90 or 100 times, as thoſe of that length uſually do, the vapours which continually float near the earth in great plenty, will be ſo magnified as to render viſion obſcure.

269 Galilean teleſcope. 2. *The Galilean Teleſcope* with the concave eye-glaſs is conſtructed as follows:

Plate CCCLXV. AB (fig. 1.) is an object ſending forth the pencils of rays *g h i*, *k l m*, &c. which, after paſſing through the object-glaſs *c d*, tend towards *e*E*f* (where we will ſuppoſe the focus of it to be), in order to form an inverted image there as before; but in their way to it are made to paſs through the concave glaſs *n o*, ſo placed that its focus may fall upon E, and conſequently the rays of the ſeveral pencils which were converging towards thoſe reſpective focal points *e*, E, *f*, will be rendered parallel among themſelves: but the axes of thoſe pencils croſſing each other at F, and diverging from thence, will be rendered more diverging, as repreſented in the figure. Now theſe rays entering the pupil of an eye, will form a large and diſtinct image *a b* upon the retina, which will be inverted with reſpect to the object, becauſe the axis of the pencils croſs in F. The object of courſe will be ſeen erect, and the angle under which it will appear will be equal to that which the lines *a*F, *b*F, produced back through the eye-glaſs, form at F.

It is evident, that the leſs the pupil of the eye is, the leſs is the viſible area ſeen through a teleſcope of this kind; for a leſs pupil would exclude ſuch pencils as proceed from the extremities of the object AB, as is evident from the figure. This is an inconvenience that renders this teleſcope unfit for many uſes; and is only to be remedied by the teleſcope with the convex eye-glaſſes, where the rays which form the extreme parts of the image are brought together in order to enter the pupil of the eye, as explained above.

It is apparent alſo, that the nearer the eye is placed to the eye-glaſs of this teleſcope, the larger is the area ſeen through it; for, being placed cloſe to the glaſs, as in the figure, it admits rays that come from A and B, the extremities of the object, which it could not if it was placed farther off.

270 Magnifying power of. The degree of magnifying in this teleſcope is in the ſame proportion with that in the other, *viz.* as the focal diſtance of the object-glaſs is to the focal diſtance of the eye-glaſs.

For there is no other difference but this, *viz.* that as the extreme pencils in that teleſcope were made to converge and form the angle *g e b* (fig. 12.), or *i n k* (fig. 13.), theſe are now made to diverge and form the angle *a*F*b* (fig. 1.); which angles, if the concave glaſs in one has an equal refractive power with the convex one in the other, will be equal, and therefore each kind will exhibit the object magnified in the ſame degree. Plate CCCLXIV. Plate CCCLXV.

There is a defect in all theſe kinds of teleſcopes, not to be remedied in a ſingle lens by any means whatever, which was thought only to ariſe from hence, viz. that ſpherical glaſſes do not collect rays to one and the ſame point. But it was happily diſcovered by Sir Iſaac Newton, that the imperfection of this ſort of teleſcope, ſo far as it ariſes from the ſpherical form of the glaſſes, bears almoſt no proportion to that which is owing to the different refrangibility of light. This diverſity in the refraction of rays is about a 28th part of the whole; ſo that the object-glaſs of a teleſcope cannot collect the rays which flow from any one point in the object into a leſs room than the circular ſpace whoſe diameter is about the 56th part of the breadth of the glaſs.

Plate CCCLXV.

To ſhow this, let AB (fig. 2.) repreſent a convex lens, and let CDF be a pencil of rays flowing from the point D; let H be the point at which the leaſt refrangible rays are collected to a focus; and I, that where the moſt refrangible concur. Then, if IH be the 28th part of EH, IK will be a proportionable part of EC (the triangles HIK and HEC being ſimilar): conſequently LK will be the 28th part of FC. But MN will be the leaſt ſpace into which the rays will be collected, as appears by their progreſs repreſented in the figure. Now MN is but about half of KL; and therefore it is about the 56th part of CF; ſo that the diameter of the ſpace into which the rays are collected will be about the 56th part of the breadth of that part of the glaſs through which the rays paſs; which was to be ſhown.

Since therefore each point of the object will be repreſented in ſo large a ſpace, and the centres of thoſe ſpaces will be contiguous, becauſe the points in the object the rays flow from are ſo; it is evident, that the image of an object made by ſuch a glaſs muſt be a moſt confuſed repreſentation, though it does not appear ſo when viewed through an eye-glaſs that magnifies in a moderate degree; conſequently the degree of magnifying in the eye-glaſs muſt not be too great with reſpect to that of the object-glaſs, leſt the confuſion become ſenſible.

271
Refracting teleſcopes magnify in proportion to their length.

Notwithſtanding this imperfection, a dioptrical teleſcope may be made to magnify in any given degree, provided it be of ſufficient length; for the greater the focal diſtance of the object-glaſs is, the leſs may be the proportion which the focal diſtance of the eye-glaſs may bear to that of the object-glaſs, without rendering the image obſcure. Thus, an object-glaſs, whoſe focal diſtance is about four feet, will admit of an eye-glaſs whoſe focal diſtance ſhall be little more than an inch, and conſequently will magnify almoſt 48 times; but an object-glaſs of 40 feet focus will admit of an eye-glaſs of only four inches focus, and will therefore magnify 120 times; and an object-glaſs of 100 feet focus will admit of an eye-glaſs of little more than ſix inches focus, and will therefore magnify almoſt 200 times.

The reaſon of this diſproportion in their ſeveral degrees of magnifying is to be explained in the following manner: Since the diameter of the ſpaces, into which rays flowing from the ſeveral points of an object are collected, are as the breadth of the object-glaſs, it is evident that the degree of confuſedneſs in the image is as the breadth of that glaſs; for the degree of confuſedneſs will only be as the diameters or breadths of thoſe ſpaces, and not as the ſpaces themſelves. Now the focal length of the eye-glaſs, that is, its power of magnifying, muſt be as that degree; for, if it exceeds it, it will render the confuſedneſs ſenſible; and therefore it muſt be as the breadth or diameter of the object-glaſs. The diameter of the object-glaſs, which is as the ſquare root of its aperture or magnitude, muſt be as the ſquare root of the power of magnifying in the teleſcope; for unleſs the aperture itſelf be as the power of magnifying, the image will want light: the ſquare root of the power of magnifying will be as the ſquare root of the focal diſtance of the object-glaſs; and therefore the focal diſtance of the eye-glaſs muſt be only as the ſquare root of that of the object-glaſs. So that in making uſe of an object-glaſs of a longer focus, ſuppoſe, than one that is given, you are not obliged to apply an eye-glaſs of a proportionably longer focus than what would ſuit the given object-glaſs, but ſuch a one only whoſe focal diſtance ſhall be to the focal diſtance of that which will ſuit the given object-glaſs, as the ſquare root of the focal length of the object-glaſs you make uſe of, is to the ſquare root of the focal length of the given one. And this is the reaſon that longer teleſcopes are capable of magnifying in a greater degree than ſhorter ones, without rendering the object confuſed or coloured.

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Their imperfections remedied by Dollond and Blair.

3. But the inconveniency of very long teleſcopes is ſo great, that different attempts have been made to remove it. Of theſe, the moſt ſucceſsful have been by Dollond and Blair; and the general principles upon which theſe eminent opticians proceeded have been mentioned in the hiſtorical part of this article, and in the preceding ſection. The public will ſoon be favoured with a fuller account of Dr Blair's diſcovery from his own pen; and of Dollond's, it may be ſufficient to obſerve, in addition to what has been already ſaid, that the object-glaſſes of his teleſcopes are compoſed of three diſtinct lenſes, two convex and one concave; of which the concave one is placed in the middle, as is repreſented in fig. 3. where *a* and *c* ſhow the two convex lenſes, and *b b* the concave one, which is by the Britiſh artiſts placed in the middle. The two convex ones are made of London crown glaſs, and the middle one of white flint glaſs; and they are all ground to ſpheres of different radii, according to the refractive powers of the different kinds of glaſs and the intended focal diſtance of the object-glaſs of the teleſcope. According to Boſcovich, the focal diſtance of the parallel rays for the concave lens is one-half, and for the convex glaſs one-third of the combined focus. When put together, they refract the rays in the following manner. Let *a b*, *a b* (fig. 4.), be two red rays of the ſun's light falling parallel on the firſt convex lens *c*. Suppoſing there was no other lens preſent but that one, they would then be converged into the lines *b e*, *b e*, and at laſt meet in the focus *q*. Let the lines *g h*, *g h*, repreſent two violet rays falling on the ſurface of the lens. Theſe are alſo refracted, and will meet in a focus; but as they have a greater degree of refrangibility than the red rays, they muſt of conſequence converge more by the ſame power of refraction in the glaſs, and meet ſooner in a focus, ſuppoſe at *r*.—Let now the concave lens *d d* be placed in ſuch a manner as to intercept all the rays before they come to their focus. Were this lens made of the ſame materials, and ground to the ſame radius with the convex one, it would

Fig. 1.

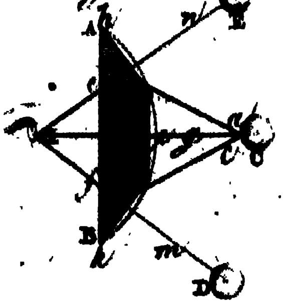


Fig. 2.

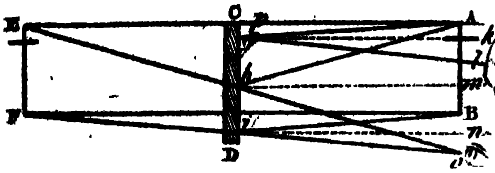


Fig. 3.

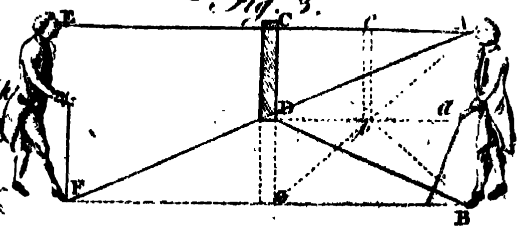


Fig. 4.

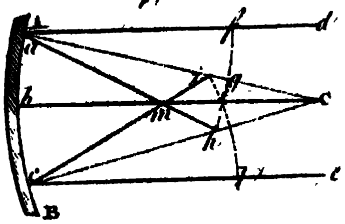


Fig. 5.

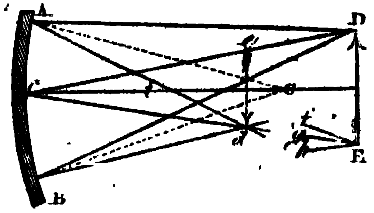


Fig. 6.

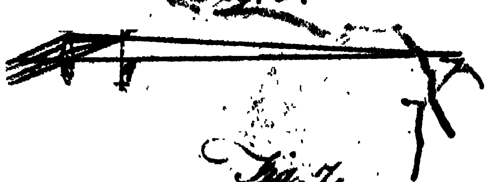


Fig. 7.

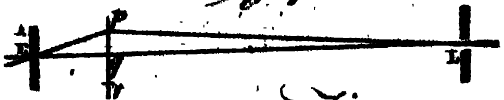


Fig. 8.

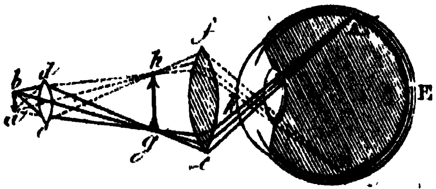


Fig. 10.

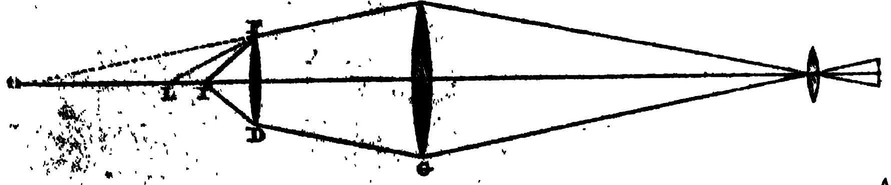


Fig. 9.

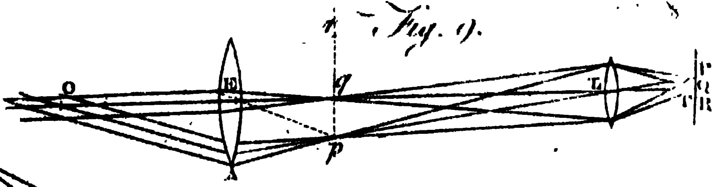


Fig. 11.

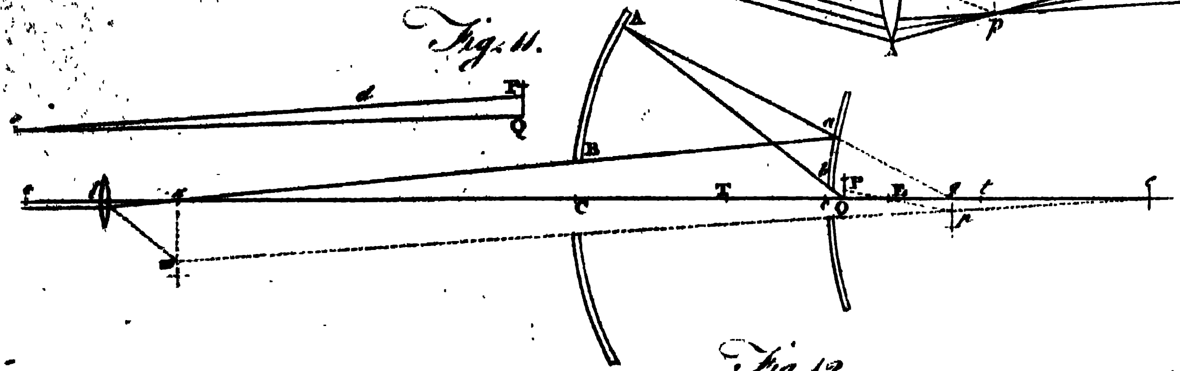


Fig. 12.

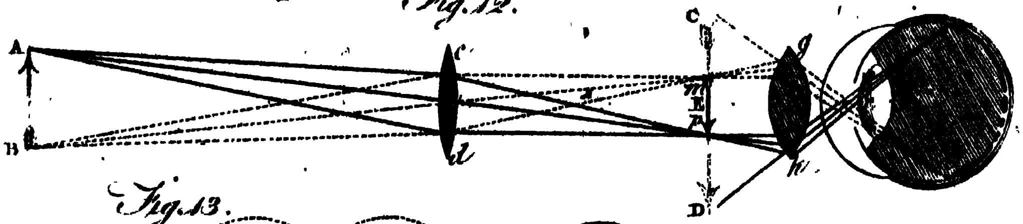
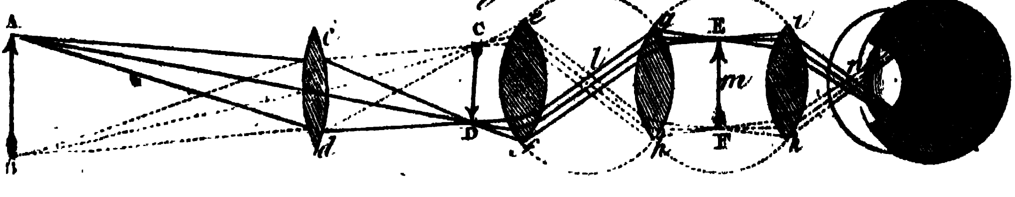


Fig. 13.



A. Bell Prin. Wal. Sculptor fecit.

would have the ſame power to cauſe the rays diverge that the former had to make them converge. In this caſe, the red rays would become parallel, and move on in the line oo, oo: But the concave lens, being made of flint glaſs, and upon a ſhorter radius, has a greater refractive power, and therefore they diverge a little after they come out of it; and if no third lens was interpoſed, they would proceed diverging in the lines opt, opt; but, by the interpoſition of the third lens ovo, they are again made to converge, and meet in a focus ſomewhat more diſtant than the former, as at x. By the concave lens the violet rays are alſo refracted, and made to diverge: but having a greater degree of refrangibility, the ſame power of refraction makes them diverge ſomewhat more than the red ones; and thus, if no third lens was interpoſed, they would proceed in ſuch lines as [illegible] n. Now as the differently coloured rays fall upon the third lens with different degrees of divergence, it is plain, that the ſame power of refraction in that lens will operate upon them in ſuch a manner as to bring them all together to a focus very nearly at the ſame point. The red rays, it is true, require the greateſt power of refraction to bring them to a focus; but they fall upon the lens with the leaſt degree of divergence. The violet rays, though they require the leaſt power of refraction, yet have the greateſt degree of divergence; and thus all meet together in the point x, or very nearly ſo.

But, though we have hitherto ſuppoſed the refraction of the concave lens to be greater than that of the convex ones, it is eaſy to ſee how the errors occaſioned by the firſt lens may be corrected by it, though it ſhould have even a leſs power of refraction than the convex one. Thus, let ab, ab (fig. 5), be two rays of red light falling upon the convex lens c, and refract- ate
XV. ed into the focus q; let alſo gb, gb, be two violet rays converged into a focus at r; it is not neceſſary, in order to their convergence into a common focus at x, that the concave lens ſhould make them *diverge*: it is ſufficient if the glaſs has a power of diſperſing the violet rays ſomewhat more than the red ones; and many kinds of glaſs have this power of diſperſing ſome kinds of rays, without a very great power of refraction. It is better, however, to have the object-glaſs compoſed of three lenſes; becauſe there is then another correction of the aberration by means of the third lens; and it might be impoſſible to find two lenſes, the errors of which would exactly correct each other. It is alſo eaſy to ſee, that the effect may be the ſame whether the concave glaſs is a portion of the ſame ſphere with the others or not; the effect depending upon a combination of certain circumſtances, of which there is an infinite variety.

By means of this correction of the errors ariſing from the different refrangibility of the rays of light, it is poſſible to ſhorten dioptric teleſcopes conſiderably, and yet leave them equal magnifying powers. The reaſon of this is, that the errors ariſing from the object-glaſs being removed, thoſe which are occaſioned by the eye-glaſs are inconſiderable: for the error is always in proportion to the length of the focus in any glaſs; and in very long teleſcopes it becomes exceedingly great, being no leſs than $\frac{1}{28}$th of the whole; but in glaſſes of a few inches focus it becomes trifling. Refracting teleſcopes, which go by the name of *Dollond's*, are therefore now conſtructed in the following manner. Let AB (fig. 6.) repreſent an object-glaſs compoſed of three lenſes as above deſcribed, and converging the rays 1, 2, 3, 4, &c. to a very diſtant focus as at x. By means of the interpoſed lens CD, however, they are converged to one much nearer, as at y, where an image of the object is formed. The rays diverging from thence fall upon another lens EF, where the pencils are rendered parallel, and an eye placed near that lens would ſee the object magnified and very diſtinct. To enlarge the magnifying power ſtill more, however, the pencils thus become parallel are made to fall upon another at GH; by which they are again made to converge to a diſtant focus: but, being intercepted by the lens IK, they are made to meet at the nearer one z; whence diverging to LM, they are again rendered parallel, and the eye at N ſees the object very diſtinctly.

From an inſpection of the figure it is evident, that Dollond's teleſcope thus conſtructed is in fact two teleſcopes combined together; the firſt ending with the lens EF, and the ſecond with LM. In the firſt we do not perceive the object itſelf, but the image of it formed at y; and in the ſecond we perceive only the image of that image formed at z. Nevertheleſs ſuch teleſcopes are exceedingly diſtinct, and repreſent objects ſo clearly as to be preferred, in viewing terreſtrial things, even to reflectors themſelves. The latter indeed have greatly the advantage in their powers of magnifying, but they are much deficient in point of light. Much more light is loſt by reflection than by refraction: and as in theſe teleſcopes the light muſt unavoidably ſuffer two reflections, a great deal of it is loſt; nor is this loſs counterbalanced by the greater aperture which theſe teleſcopes will bear, which enables them to receive a greater quantity of light than the refracting ones. The metals of reflecting teleſcopes alſo are very much ſubject to tarniſh, and require much more dexterity to clean them than the glaſſes of refractors; which makes them more troubleſome and expenſive, though for making diſcoveries in the celeſtial regions they are undoubtedly the only proper inſtruments which have been hitherto conſtructed. If Dr Blair indeed ſhall be ſo fortunate as to diſcover a vitreous ſubſtance of the ſame powers with the fluid in the compound object-glaſs of his teleſcope (and from his abilities and perſeverance we have every thing to hope), a refracting teleſcope may be conſtructed ſuperior for every purpoſe to the beſt reflector.

II. The Reflecting Teleſcope.

The inconveniences ariſing from the great length of refracting teleſcopes, before Dollond's diſcovery, are ſufficiently obvious; and theſe, together with the difficulties occaſioned by the different refrangibility of 273
light, induced Sir Iſaac Newton to turn his attention Newton's
to the ſubject of reflection, and endeavours to realize teleſcope.
the ideas of himſelf and others concerning the poſſibility of conſtructing teleſcopes upon that principle.—The inſtrument which he contrived is repreſented, fig. 7. where ABCD is a large tube, open at AD and cloſed at BC, and of a length at leaſt equal to the diſtance of the focus from the metallic ſpherical concave ſpeculum GH placed at the end BC. The rays EG, FH, &c. proceeding from a remote object PR, intersect

interſect one another ſomewhere before they enter the tube, ſo that EG, *eg* are thoſe that come from the lower part of the object, and *fh*, FH from its upper part: theſe rays after falling on the ſpeculum GH, will be reflected, ſo as to converge and meet in *m n*, where they will form a perfect image of the object.—But as this image cannot be ſeen by the ſpectator, they are intercepted by a ſmall plane metallic ſpeculum KK, interſecting the axis at an angle of 45°, by which the rays tending to *m n* will be reflected towards a hole LL in the ſide of the tube, and the image of the object will thus be formed in *q* S; which image will be leſs diſtinct, becauſe ſome of the rays which would otherwiſe fall on the concave ſpeculum GH, are intercepted by the plane ſpeculum: nevertheleſs it will appear in a conſiderable degree diſtinct, becauſe the aperture AD of the tube, and the ſpeculum GH are large. In the lateral hole LL is fixed a convex lens, whoſe focus is at S*q*; and therefore this lens will refract the rays that proceed from any point of the image, ſo as at their exit they will be parallel, and thoſe that proceed from the extreme points S*q* will converge after refraction, and form an angle at O, where the eye is placed; which will ſee the image S*q*, as if it were an object, through the lens LL; conſequently the object will appear enlarged, inverted, bright, and diſtinct. In LL lenſes of different convexities may be placed, which by being moved nearer to the image or farther from it, would repreſent the object more or leſs magnified, provided that the ſurface of the ſpeculum GH be of a perfectly ſpherical figure. If, in the room of one lens LL, three lenſes be diſpoſed in the ſame manner with the three eye-glaſſes of the refracting teleſcope, the object will appear erect, but leſs diſtinct than when it is obſerved with one lens. On account of the poſition of the eye in this teleſcope, it is extremely difficult to direct the inſtrument towards any object. Huygens, therefore, firſt thought of adding to it a ſmall refracting teleſcope, the axis of which is parallel to that of the reflector. This is called a *finder* or *director*. The Newtonian teleſcope is alſo furniſhed with a ſuitable apparatus for the commodious uſe of it.

274 The magnifying power. Plate CCCLXV. In order to determine the magnifying power of this teleſcope, it is to be conſidered that the plane ſpeculum KK is of no uſe in this reſpect. Let us then ſuppoſe, that one ray proceeding from the object coincides with the axis GLIA (fig. 8.) of the lens and ſpeculum; let *b b* be another ray proceeding from the lower extreme of the object, and paſſing through the focus I of the ſpeculum KH: this will be reflected in the direction *b i d*, parallel to the axis GLA, and falling on the lens *d* L *d*, will be refracted to G; ſo that GL will be equal to L I, and $dG=dI$. To the naked eye the object would appear under the angle $Ibi=bIA$; but by means of the teleſcope it appears under the angle $dGL=dIL=Idi$: and the angle Idi is to the angle $Ibi :: Ib : Id$; conſequently the apparent magnitude by the teleſcope is to that by the naked eye as the diſtance of the focus of the ſpeculum from the ſpeculum, to the diſtance of the focus of the lens from the lens.

The Newtonian teleſcope was ſtill inconvenient. Notwithſtanding the contrivance of Huygens, objects were by it found with difficulty. The teleſcope of Gregory, therefore, ſoon obtained the preference, to which [illegible] moſt purpoſes it is juſtly entitled, as the reader will perceive from the following conſtruction.

275 Gregorian teleſcope. Let TT (fig. 9.) be a braſs tube, in which L*ld*D is a metallic concave ſpeculum, perforated in the middle at X; and EF a leſs concave mirror, ſo fixed by the arm or long wire RT, which is moveable by means of a long ſcrew on the outſide of the tube, as to be moved nearer to or farther from the larger ſpeculum L*ld*D, its axis being kept in the ſame line with that of the great one. Let AB repreſent a very remote object from each part of which iſſue pencils of rays, e. g. *c d*, CD from A the upper extreme of the object, and IL, *i l*, from the lower part B; the rays IL, CD from the extremes croſſing one another before they enter the tube. Theſe rays falling upon the larger mirror LD, are reflected from it into the focus KH, where they form an inverted image of the object AB, as in the New[illegible]leſcope. From this image the rays, diverging as [illegible] object, fall upon the ſmall mirror EF, the centre [illegible] which is at *e*; ſo that after reflection they would [illegible] their foci at Q Q, and there form an erect [illegible]. But ſince an eye at that place could ſee but [illegible] ſmall part of an object, in order to bring rays from more diſtant parts of it into the pupil, they are intercepted by the plano-convex lens MN, by which means a ſmaller erect image is formed at PV, which is viewed from the meniſcus SS by an eye at O. This meniſcus both makes the rays of each pencil parallel and magnifies the image PV. At the place of this image all the foreign rays are intercepted by the perforated partition ZZ. For the ſame reaſon the hole near the eye O is very narrow. When nearer objects are viewed by this teleſcope, the ſmall ſpeculum EF is removed to a greater diſtance from the larger LD, ſo that the ſecond image may be always formed in PV; and this diſtance is to be adjuſted (by means of the ſcrew on the outſide of the great tube) according to the form of the eye of the ſpectator. It is alſo neceſſary, that the axis of the teleſcope ſhould paſs through the middle of the ſpeculum EF, and its centre, the centre of the ſpeculum LL, and the middle of the hole X, the centres of the lenſes MN, SS, and the hole near O. As the hole X in the ſpeculum LL can reflect none of the rays iſſuing from the object, that part of the image which correſponds to the middle of the object muſt appear to the obſerver more dark and confuſed than the extreme parts of it. Beſides, the ſpeculum EF will alſo intercept many rays proceeding from the object; and therefore unleſs the aperture TT be large, the object muſt appear in ſome degree obſcure.

In the beſt reflecting teleſcopes, the focus of the ſmall mirror is never coincident with the focus of the great one, where the firſt image KH is formed, but a little beyond it (with reſpect to the eye), as at *n*; the conſequence of which is, that the rays of the pencils will not be parallel after reflection from the ſmall mirror, but converge ſo as to meet in points about Q *q* Q, where they would form a larger upright image than PV, If the glaſs R was not in their way; and this image might be viewed by means of a ſingle eye-glaſs properly placed between the image and the eye; but then the field of view would be leſs, and conſequently

Fig. 1.

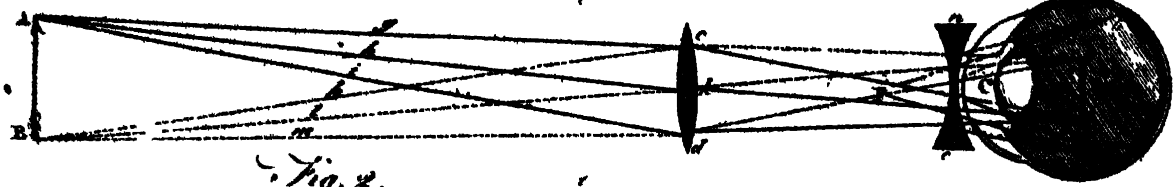
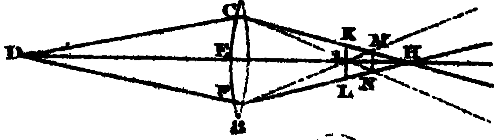


Fig. 2.



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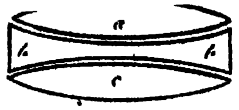

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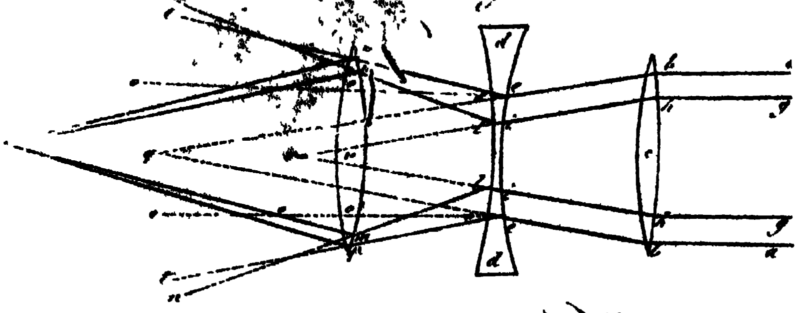

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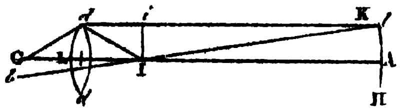

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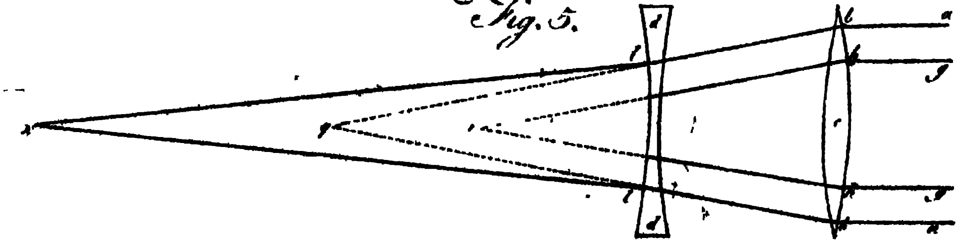

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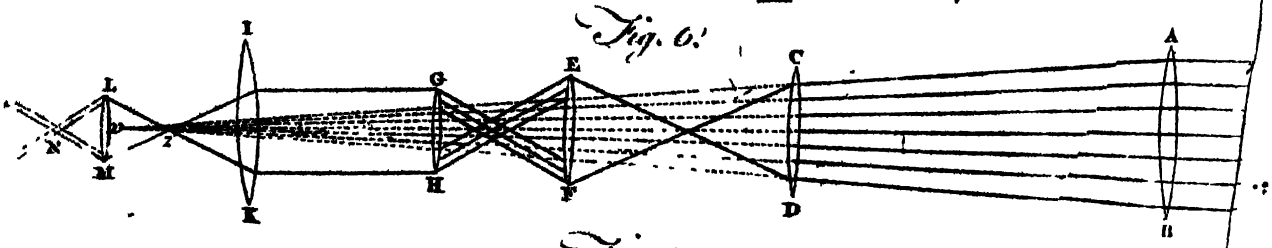

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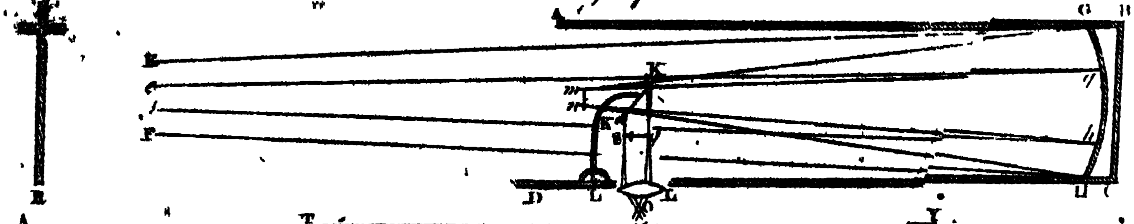

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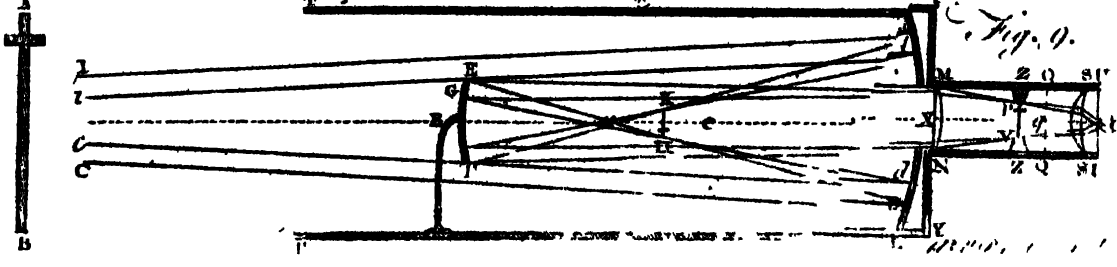
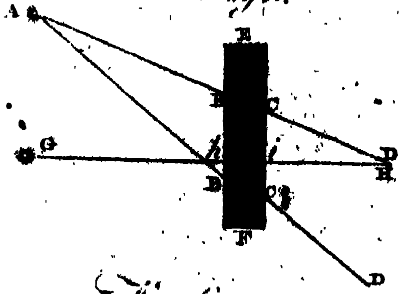


Fig. 1.



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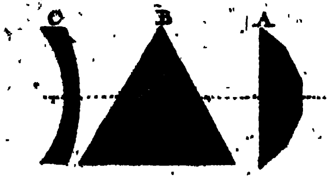

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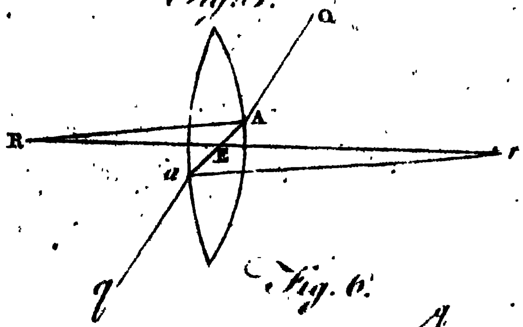

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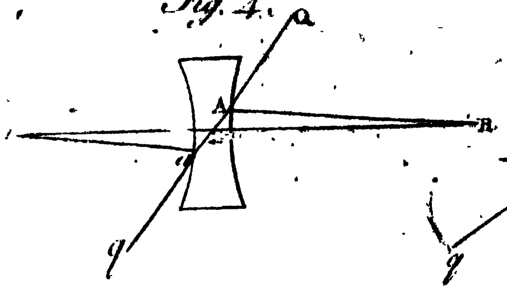

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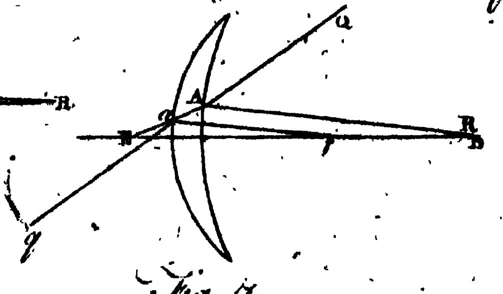

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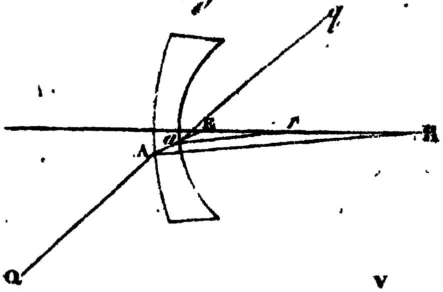

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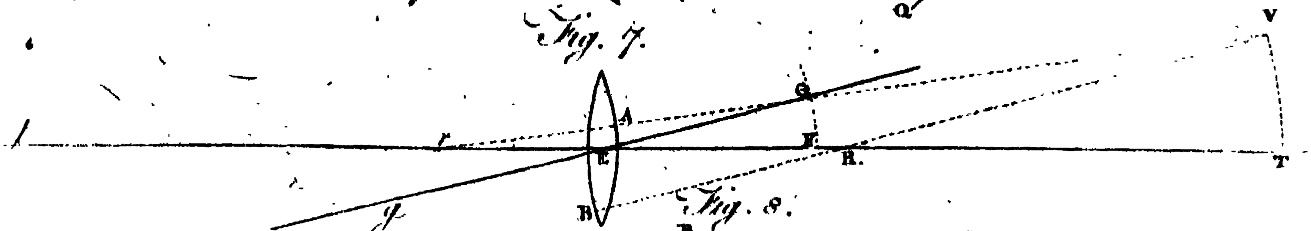

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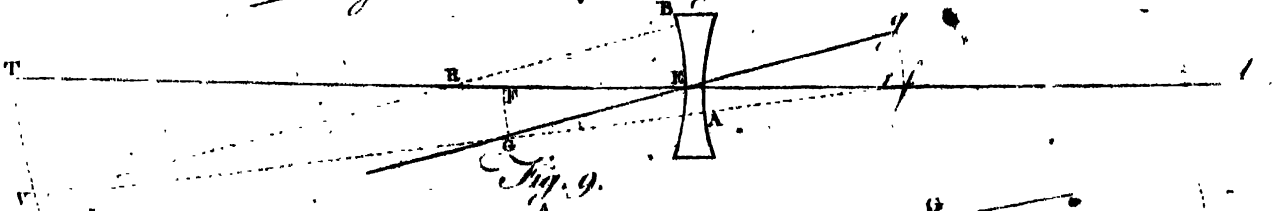

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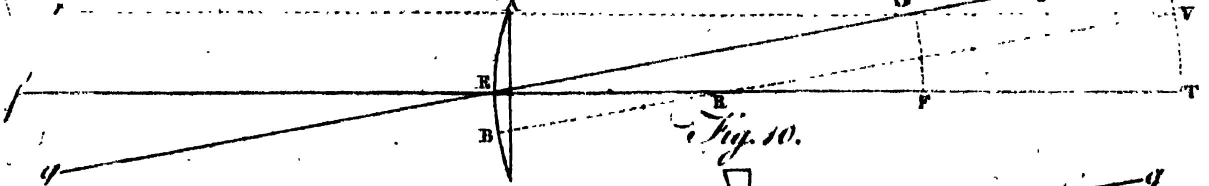

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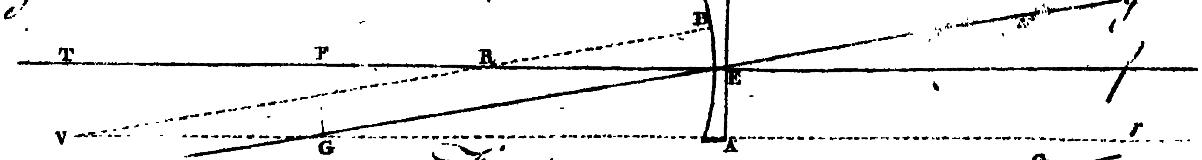

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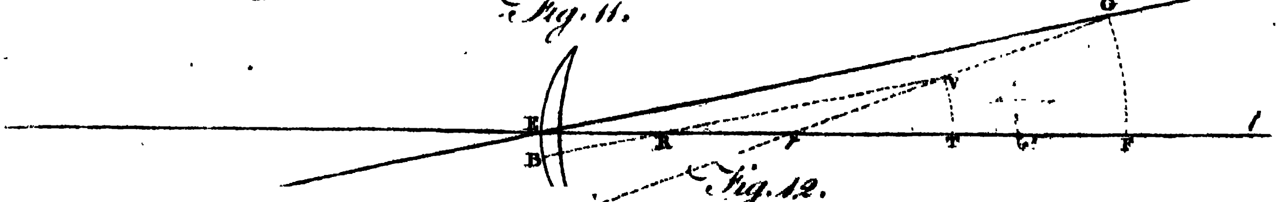

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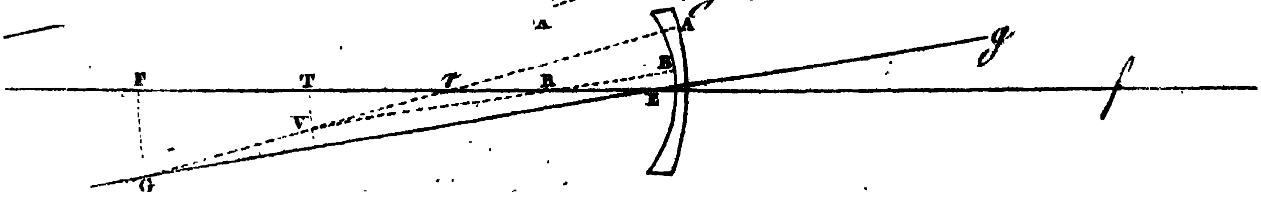

A. Bell Prin. Wal. Sculptor fecit.

quently not ſo pleaſant; for which reaſon, the glaſs R is ſtill retained, to enlarge the ſcope or area of the field.

276 Its magnifying power.

To find the magnifying power of this teleſcope, multiply the focal diſtance of the great mirror by the diſtance of the ſmall mirror from the image next the eye, and multiply the focal diſtance of the ſmall mirror by the focal diſtance of the eye-glaſs: then divide the product of the former multiplication by the product of the latter, and the quotient will expreſs the magnifying power.

One great advantage of the reflecting teleſcope is, that it will admit of an eye-glaſs of a much ſhorter focal diſtance than a refracting teleſcope will; and conſequently it will magnify ſo much the more: for the rays are not coloured by reflection from a concave mirror, if it be ground to a true figure, as they are by paſſing through a convex glaſs, let it be ground ever ſo true.

The nearer an object is to the teleſcope, the more its pencils of rays will diverge before they fall upon the great mirror, and therefore they will be the longer of meeting in points after reflection; ſo that the firſt image KH will be formed at a greater diſtance from the large mirror, when the object is near the teleſcope, than when it is very remote. But as this image muſt be formed farther from the ſmall mirror than its principal focus *n*, this mirror muſt be always ſet at a greater diſtance from the large one, in viewing near objects, than in viewing remote ones. And this is done by turning the ſcrew on the outſide of the tube, until the ſmall mirror be ſo adjuſted, that the object (or rather its image) appears perfect.

In looking through any teleſcope towards an object, we never ſee the object itſelf, but only that image of it which is formed next the eye in the teleſcope. For if a man holds his finger or a ſtick between his bare eye and an object, it will hide part (if not the whole) of the object from his view: But if he ties a ſtick acroſs the mouth of a teleſcope before the object-glaſs, it will hide no part of the imaginary object he ſaw through the teleſcope before, unleſs it covers the whole mouth of the tube: for all the effect will be, to make the object appear dimmer, becauſe it intercepts part of the rays. Whereas, if he puts only a piece of wire acroſs the inſide of the tube, between the eye-glaſs and his eye, it will hide part of the object which he thinks he ſees; which proves, that he ſees not the real object, but its image. This is alſo confirmed by means of the ſmall mirror EF, in the reflecting teleſcope, which is made of opaque metal, and ſtands directly between the eye and the object towards which the teleſcope is turned; and will hide the whole object from the eye at O, if the two glaſſes ZZ and SS are taken out of the tube.

Great improvements have been lately made in the conſtruction of both reflecting and refracting teleſcopes, as well as in the method of applying thoſe inſtruments to the purpoſes for which they are intended. Theſe, however, fall not properly under the ſcience of optics, as fitter opportunities occur of giving a full account of them, as well as of the magic lantern, camera obſcura, &c. under other articles of our multifarious work. See CATOPTRICS, DIOPTRICS, SPECULUM, and TELESCOPE. We ſhall conclude this article with ſome obſervations

On the different Merits of Microſcopes and Teleſcopes, compared with one another; how far we may reaſonably depend on the Diſcoveries made by them, and what hopes we may entertain of further Improvements.

277 Merits of microſcopes and teleſcopes compared.

The advantages ariſing from the uſe of microſcopes and teleſcopes depend, in the firſt place, upon their property of magnifying the minute parts of objects, ſo that they can by that means be more diſtinctly viewed by the eye; and, ſecondly, upon their throwing more light into the pupil of the eye than what is done without them. The advantages ariſing from the magnifying power would be extremely limited, if they were not alſo accompanied by the latter: for if the ſame quantity of light is ſpread over a large portion of ſurface, it becomes proportionably diminiſhed in force; and therefore the objects, though magnified, appear proportionably dim. Thus, though any magnifying glaſs ſhould enlarge the diameter of the object 10 times, and conſequently magnify the ſurface 100 times, yet if the focal diſtance of the glaſs was about eight inches (provided this was poſſible), and its diameter only about the ſize of the pupil of the eye, the object would appear 100 times more dim when we looked through the glaſs, than when we beheld it with our naked eyes; and this, even on a ſuppoſition that the glaſs tranſmitted all the light which fell upon it, which no glaſs can do. But if the focal diſtance of the glaſs was only four inches, though its diameter remained as before, the inconvenience would be vaſtly diminiſhed, becauſe the glaſs could then be placed twice as near the object as before, and conſequently would receive four times as many rays as in the former caſe, and therefore we would ſee it much brighter than before. Going on thus, ſtill diminiſhing the focal diſtance of the glaſs, and keeping its diameter as large as poſſible, we will perceive the object more and more magnified, and at the ſame time very diſtinct and bright. It is evident, however, that with regard to optical inſtruments of the microſcopic kind, we muſt ſooner or later arrive at a limit which cannot be paſſed. This limit is formed by the following particulars. 1. The quantity of light loſt in paſſing through the glaſs. 2. The diminution of the glaſs itſelf, by which it receives only a ſmall quantity of rays. 3. The extreme ſhortneſs of the focal diſtance of great magnifiers, whereby the free acceſs of the light to the object which we wiſh to view is impeded, and conſequently the reflection of the light from it is weakened. 4. The aberrations of the rays, occaſioned by their different refrangibility.

To underſtand this more fully, as well as to ſee how far theſe obſtacles can be removed, let us ſuppoſe the lens made of ſuch a dull kind of glaſs that it tranſmits only one half of the light which falls upon it. It is evident that ſuch a glaſs, of four inches focal diſtance, and which magnifies the diameter of an object twice, ſtill ſuppoſing its own breadth equal to that of the pupil of the eye, will ſhow it four times magnified in ſurface, but only half as bright as if it was ſeen by the naked eye at the uſual diſtance; for the light which falls upon the eye from the object at eight inches diſtance, and likewiſe the ſurface of the object in its natural ſize, being both repreſented by 1, the ſurface of the magnified object will be 4, and the light which makes that magnified object viſible only 2; becauſe though the glaſs receives four times as much light as the naked eye does at the uſual diſtance of diſtinct viſion, yet one half is loſt in paſſing through the glaſs. The inconvenience in this reſpect can therefore be removed only as far as it is poſſible to increaſe the clearneſs of the glaſs, ſo that it ſhall tranſmit nearly all the rays which fall upon it; and how far this can be done, hath not yet been aſcertained.

The ſecond obſtacle to the perfection of microſcopic glaſſes is the ſmall ſize of great magnifiers, by which, notwithſtanding their near approach to the object, they receive a ſmaller quantity of rays than might be expected. Thus, ſuppoſe a glaſs of only $\frac{1}{10}$th of an inch focal diſtance; ſuch a glaſs would increaſe the viſible diameter 80 times, and the ſurface 6400 times. If the breadth of the glaſs could at the ſame time be preſerved as great as that of the pupil of the eye, which we ſhall ſuppoſe $\frac{2}{10}$ths of an inch, the object would appear magnified 6400 times, at the ſame time that every part of it would be as bright as it appears to the naked eye. But if we ſuppoſe that this magnifying glaſs is only $\frac{1}{10}$th of an inch in diameter, it will then only receive $\frac{1}{4}$th of the light which otherwiſe would have fallen upon it; and therefore, inſtead of communicating to the magnified object a quantity of illumination equal to 6400, it would communicate only one equal to 1600, and the magnified object would appear four times as dim as it does to the naked eye. This inconvenience, however, is ſtill capable of being removed, not indeed by increaſing the diameter of the lens, becauſe this muſt be in proportion to its focal diſtance, but by throwing a greater quantity of light on the object. Thus, in the above-mentioned example, if four times the quantity of light which naturally falls upon it could be thrown upon the object, it is plain that the reflection from it would be four times as great as in the natural way; and conſequently the magnified image, at the ſame time that it was as many times magnified as before, would be as bright as when ſeen by the naked eye. In tranſparent objects this can be done very effectually by a concave ſpeculum, as in the reflecting microſcope already deſcribed: but in opaque objects the caſe is ſomewhat more doubtful; neither do the contrivances for viewing theſe objects ſeem entirely to make up for the deficiencies of the light from the ſmallneſs of the lens and ſhortneſs of the focus.—When a microſcopic lens magnifies the diameter of an object forty times, it hath then the utmoſt poſſible magnifying power, without diminiſhing the natural brightneſs of the object.

The third obſtacle ariſes from the ſhortneſs of the focal diſtance in large magnifiers: but in tranſparent objects, where a ſufficient quantity of light is thrown on the object from below, the inconvenience ariſes at laſt from ſtraining the eye, which muſt be placed nearer the glaſs than it can well bear; and this entirely ſuperſedes the uſe of magnifiers beyond a certain degree.

The fourth obſtacle ariſes from the different refrangibility of the rays of light, and which frequently cauſes ſuch a deviation from truth in the appearances of things, that many people have imagined themſelves to have made ſurpriſing diſcoveries, and have even publiſhed them to the world; when in fact they have been only as many optical deceptions, owing to the unequal refractions of the rays. For this there ſeems to be no remedy, except the introduction of achromatic glaſſes into microſcopes as well as teleſcopes. How far this is practicable, hath not yet been tried; but when theſe glaſſes ſhall be introduced (if ſuch introduction is practicable), microſcopes will then undoubtedly have received their ultimate degree of perfection.

278 Dollond's and Blair's refracting teleſcopes ſuperior to all others.

With regard to teleſcopes, thoſe of the refracting kind have evidently the advantage of all others, where the aperture is equal, and the aberrations of the rays are corrected according to Mr Dollond's method; becauſe the image is not only more perfect, but a much greater quantity of light is tranſmitted than what can be reflected from the beſt [illegible] hitherto known. Unluckily, how[illegible] the imperfections of the glaſs ſet a limit to theſe teleſcopes, [illegible] already been obſerved, ſo that they cannot be made above three feet and a half long. On the whole, therefore, the reflecting teleſcopes are pre[illegible]le in this reſpect, that they may be made of dimenſions greatly ſuperior; by which means they can both magnify to a greater degree, and at the ſame time throw much more light into the eye.

With regard to the powers of teleſcopes, however, they are all of them exceedingly leſs than what we would be apt to imagine from the number of times which they magnify the object. Thus, when we hear of a teleſcope which magnifies 200 times, we are apt to imagine, that, on looking at any diſtant object through it, we ſhould perceive it as diſtinctly as we would with our naked eye at the 200th part of the diſtance. But this is by no means the caſe; neither is there any theory capable of directing us in this matter: we muſt therefore depend entirely on experience.

The beſt method of trying the goodneſs of any teleſcope is by obſerving how much farther off you are able to read with it than you can with the naked eye. But that all deception may be avoided, it is proper to chooſe ſomething to be read where the imagination cannot give any aſſiſtance, ſuch as a table of logarithms, or ſomething which conſiſts entirely of figures; and hence the truly uſeful power of the teleſcope is eaſily known. In this way Mr Short's large teleſcope, which magnifies the diameter of objects 1200 times, is yet unable to afford ſufficient light for reading at more than 200 times the diſtance at which we can read with our naked eye.

279 The Gregorian teleſcope ſuperior for common uſe to the Newtonian.

With regard to the form of reflecting teleſcopes, it is now pretty generally agreed, that when the Gregorian ones are well conſtructed, they have the advantage of thoſe of the Newtonian form. One advantage evident at firſt ſight is, that with the Gregorian teleſcope an object is perceived by looking directly through it, and conſequently is found with much greater eaſe than in the Newtonian teleſcope, where we muſt look into the ſide. The unavoidable imperfection of the ſpecula common to both, alſo gives the Gregorian an advantage over the Newtonian form. Notwithſtanding the utmoſt care and labour of the workmen, it is found impoſſible to give the metals either a perfectly ſpherical or a perfectly parabolical form. Hence ariſes ſome

Micro-ſcopes and Teleſcopes compared.

ſome indiſtinctneſs of the image formed by the great ſpeculum, which is frequently corrected by the little one, provided they are properly matched. But if this is not done, the error will be made much worſe; and hence many of the Gregorian teleſcopes are far inferior to the Newtonian ones; namely, when the ſpecula have not been properly adapted to each other. There is no method by which the workman can know the ſpecula which will fit one another without a trial; and therefore there is a neceſſity for having many ſpecula ready made of each ſort, that in fitting up a teleſcope thoſe may be choſen which beſt ſuit each other.

The brightneſs of any object ſeen through a teleſcope, in compariſon with its brightneſs when ſeen by the naked eye, may in all caſes be eaſily found by the following formula. Let n repreſent the natural diſtance of a viſible object, at which it can be diſtinctly ſeen; and let d repreſent its diſtance from the object-glaſs of the inſtrument. Let m be the magnifying power of the inſtrument; that is, let the viſual angle ſubtended at the eye by the object when at the diſtance n, and viewed without the inſtrument, be to the viſual angle produced by the inſtrument as 1 to m.

Micro-ſcopes and Teleſcopes compared.

Let a be the diameter of the object-glaſs, and p be that of the pupil. Let the inſtrument be ſo conſtructed, that no parts of the pencils are intercepted for want of ſufficient apertures of the intermediate glaſſes. Laſtly, Let the light loſt in reflection or refraction be neglected.

The brightneſs of viſion through the inſtrument will be expreſſed by the fraction $\frac{a\,n}{m\,p\,d}$, the brightneſs of natural viſion being 1. But although this fraction may exceed unity, the viſion through the inſtrument will not be brighter than natural viſion. For, when this is the caſe, the pupil does not receive all the light tranſmitted through the inſtrument.

In microſcopes, n is the neareſt limits of diſtinct viſion, nearly 8 inches. But a difference in this circumſtance, ariſing from a difference in the eye, makes no change in the formula, becauſe m changes in the ſame proportion with n.

In teleſcopes n and d may be accounted equal, and the formula becomes $\frac{a^2}{mp^2}$.

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Optimates, Optio.

OPTIMATES, one of the diviſions of the Roman people oppoſed to *populares*. It is not eaſy to aſcertain the characteriſtic differences betwixt theſe two parties. Some ſay the optimates were warm ſupporters of the dignity of the chief magiſtrate, and promoters of the grandeur of the ſtate, who cared not if the inferior members ſuffered, provided the commanding powers were advanced: Whereas the populares boldly ſtood up for the rights of the people, pleaded for larger privileges, and laboured to bring matters nearer to a level. In ſhort, they reſembled, according to this account, the court and country parties amongſt the people of this iſland.

Tully ſays, that the optimates were the beſt citizens, who wiſhed to deſerve the approbation of the better ſort; and that the populares courted the favour of the populace, not ſo much conſidering what was right, as what would pleaſe the people and gratify their own thirſt of vain glory and empty applauſe.

OPTIO, an officer in the Roman army, being an aſſiſtant or lieutenant to every centurion. The *optio* was ſo called becauſe he was the choice or option of the centurion in later times; at firſt, however, he had been choſen by the tribune, or chief commander of the legion. Theſe *optiones* are alſo ſometimes called *ſuccenturiones* and *tergiductores*; the laſt name was given them becauſe their poſt was in the rear of the company. Some authors make mention of *ſub-optiones* or ſub-lieutenants.

Option, Opuntia.

It is proper, however, to add, that optiones were not peculiar to the camp, but were alſo uſed in a variety of other offices of life.

OPTION, the power or faculty of wiſhing, or chooſing; or the choice a perſon makes of any thing.

When a new ſuffragan biſhop is conſecrated, the archbiſhop of the province, by a cuſtomary prerogative, claims the collation of the firſt vacant benefice, or dignity, in that ſee, according as he ſhall chooſe; which choice is called the archbiſhop's *option*.

But in caſe the biſhop dies, or is tranſlated, before the preſent incumbent of the promotion choſen by the archbiſhop ſhall die or be removed, it is generally ſuppoſed that the option is void; inaſmuch as the granter, ſingly and by himſelf, could not convey any right or title beyond the term of his continuance in that ſee. And if the archbiſhop dies before the avoidance ſhall happen, the right of filling up the vacancy ſhall go to his executors or adminiſtrators.

OPUNTIA, a ſpecies of cactus; ſee CACTUS. The fruit of the opuntia is remarkable for colouring the juices of living animals, though it appears not to be poiſonous or even hurtful to the body. In a letter from Charleſtown in South Carolina, which was publiſhed in the 50th volume of the Philoſophical Tranſactions, the author writes thus:—" As you deſired, I tried the effects of the prickly pear in clearing the urine. A few days after your letter, I went down to one of the iſlands, and gathered ſome of the fruit, and gave four of the pears to a child of three years of age, and ſix pears to one of five. The next morning I examined the urine of both, and it appeared of a very lively red colour, as if tart wine had been mixed with water. I gave likewiſe ſix pears to a negro wench, who was ſuckling an infant, and ſtrictly forbade her to put the child to her breaſt for ſix or eight hours; and then taking ſome of her milk in a teacup, and ſetting it by for ſome hours, the cream had a reddiſh luſtre, though it was very faint." From the ſame letter we learn, that the prickly pear grows in great abundance about Carolina; and alſo that the cochineal inſects are found upon it, though no attempt, that we know of, has hitherto been made to cure them for uſe as the Spaniards do.

OR, the French word for gold, by which this metal is expreſſed in heraldry. In engraving it is denoted by ſmall points all over the field or bearing. It may be ſuppoſed to ſignify of itſelf, *generoſity*, *ſplendour*, or *ſolidity*; according to G. Leigh, if it is compounded with

Gul.	it ſignifies	Courage.
Azu.		Truſt.
Vor.		Joy.
Pur.		Charity.
Sab.		Conſtancy.

ORA, in antiquity, was a term equivalent to an ounce; but it has been much debated among our antiquaries, whether the ora, the mention of which ſo often occurs, was a coin, or only money of account. Dr Hickes obſerves, that the mode of reckoning money by marks and oras was never known in England till after the Daniſh ſettlements; and by examining the old nummulary eſtimates among the principal Gothic ſtates upon the Baltic, it appears, that the ora and ſolidus were ſynonymous terms, and that the ora was the eighth part of the mark. From ſeveral of the Daniſh laws, it likewiſe appears, that the Daniſh ora, derived by corruption from *aureus*, was the ſame as the Frank ſolidus of twelve pence. As a weight, the ora was regarded as the uncia or unit, by which the Daniſh mark was divided; and in Doomſday book the ora is uſed for the ounce, or the twelfth part of the nummulary Saxon pound, and the fifteenth of the commercial: as a coin, it was an aureus, or the Frank ſolidus of twelve pence. And from the accidental coincidence of the Frank aureus with the eighth part of their mark, the Danes probably took occaſion to give it the new name of *ora*. There was another ora mentioned in the rolls of the 27th of Henry III. the value of which was ſixteen pence; and this was probably derived from the half marcus of the Saxons. Such, in all appearance, was the original of theſe two oras; as there were no aurei of that period, to which theſe two denominations of money of ſixteen and twelve pence can poſſibly be aſcribed. It is obſerved farther, that the name *ora* diſtinguiſhes the gold coins in ſeveral parts of Europe to this day. The Portugueſe moidore is nothing elſe but *moeda d'oro*, from the Latin *moneta de auro*; the French *Louis d'ores* come from the ſame uſe of the word, and owe their appellation to the ora. See Clarke on Coins.

ORACH. See Atriplex.

Wild Orach. See Chenopodium.

ORACLE, among the heathens, was the anſwer which the gods were ſuppoſed to give to thoſe who conſulted them upon any affair of importance. It is alſo uſed for the god who was thought to give the anſwer, and for the place where it was given.

The credit of oracles was ſo great, that in all doubts and diſputes their determinations were held ſacred and inviolable: whence vaſt numbers flocked to them for advice about the management of their affairs; and no buſineſs of any conſequence was undertaken, ſcarce any peace concluded, any war waged, or any new form of government inſtituted, without the advice and approbation of ſome oracle. The anſwers were uſually given by the intervention of the prieſt or prieſteſs of the god who was conſulted; and generally expreſſed in ſuch dark and unintelligible phraſes, as might be eaſily wreſted to prove the truth of the oracle whatever was the event. It is not, therefore, to be wondered at, that the prieſts who delivered them were in the higheſt credit and eſteem, and that they managed this reputation ſo as greatly to promote their own particular advantage. They accordingly allowed no man to conſult the gods, before he had offered coſtly ſacrifices, and made rich preſents to them. And to keep up the veneration for their oracles, and to prevent their being taken unprepared, they admitted perſons to conſult the gods only at certain ſtated times; and ſometimes they were ſo cautious, that the greateſt perſonages could obtain no anſwer at all. Thus Alexander himſelf was peremptorily denied by the Pythia, or prieſteſs of Apollo, till ſhe was by downright force obliged to aſcend the tripos; when, being unable to reſiſt any longer, ſhe cried out, *Thou art invincible:* and theſe words were accepted inſtead of a farther oracle.

Of the ambiguity of oracles, the following, out of a great many examples, may be mentioned. Crœſus having received from the Pythoneſs this anſwer, That by paſſing the river Halys, he would deſtroy a great empire; he underſtood it to be the empire of his enemy, whereas he deſtroyed his own.—The oracle conſulted by Pyrrhus gave him an anſwer, which might be equally underſtood of the victory of Pyrrhus, and the victory of the Romans his enemies:

Aio te, Æacida, Romanos vincere poſſe.

The equivocation lies in the conſtruction of the Latin tongue, which cannot be rendered in Engliſh.—The Pythoneſs adviſed Crœſus to guard againſt the mule. The king of Lydia underſtood nothing of the oracle, which denoted Cyrus deſcended from two different nations; from the Medes, by Mandana his mother, the daughter of Aſtyages; and from the Perſians, by his father Cambyſes, whoſe race was by far leſs grand and illuſtrious.—Nero had for anſwer, from the oracle of Delphos, that ſeventy-three might prove fatal to him. He believed he was ſafe from all danger till that age; but, finding himſelf deſerted by every one, and hearing Galba proclaimed emperor, who was 73 years of age, he was ſenſible of the deceit of the oracle.

When men began to be better inſtructed by the lights philoſophy had introduced into the world, the falſe oracles inſenſibly loſt their credit. Chryſippus filled an entire volume with falſe or doubtful oracles. Oenomaus, to be revenged of ſome oracle that had deceived him, made a compilation of oracles, to ſhow their ridiculous vanity. Euſebius has preſerved ſome fragments of this criticiſm on oracles by Oenomaus. "I might (ſays Origen) have recourſe to the authority of Ariſtotle and the Peripatetics, to make the Pythoneſs much ſuſpected; I might extract from the writings of Epicurus and his ſectators an abundance of things to diſcredit oracles; and I might ſhow that the Greeks themſelves made no great account of them."

The reputation of oracles was greatly leſſened when they became an artifice of politics. Themiſtocles, with a deſign of engaging the Athenians to quit Athens, and to embark, in order to be in a better condition to reſiſt Xerxes, made the Pythoneſs deliver an oracle, commanding them to take refuge in wooden walls. Demoſthenes ſaid, that the Pythoneſs *Philippized;* to ſignify that ſhe was gained over by Philip's preſents.

The ceſſation of oracles is atteſted by ſeveral profane authors; as Strabo, Juvenal, Lucan, and others. Plutarch accounts for it, by ſaying, that the benefits of the gods are not eternal as themſelves are; or that the genii, who preſided over oracles, are ſubject to death; or that the exhalations of the earth had been exhauſted. It appears that the laſt reaſon had been alleged in the time of Cicero, who ridicules it in his ſecond book of Divination, as if the ſpirit of prophecy, ſuppoſed to be excited by ſubterraneous effluvia, had evaporated by length of time, as wine or pickle by being long kept.

Suidas, Nicephorus, and Cedrenus, relate, that Auguſtus, having conſulted the oracle of Delphos, could obtain no other anſwer but this: "The Hebrew child whom all the gods obey, drives me hence, and ſends me back to hell: get out of this temple without ſpeaking one word." Suidas adds, that Auguſtus dedicated an altar in the Capitol, with this inſcription, "To the eldeſt Son of God." Notwithſtanding theſe teſtimonies, the anſwer of the oracle of Delphos to Auguſtus ſeems very ſuſpicious. Cedrenus cites Euſebius for this oracle, which is not now found in his works; and Auguſtus's peregrination into Greece was 18 years before the birth of Chriſt.

Suidas and Cedrenus give an account alſo of an ancient oracle delivered to Thulis, a king of Egypt, which they ſay is well authenticated. The king having conſulted the oracle of Serapis, to know if there ever was, or would be, one ſo great as himſelf, received this anſwer: Firſt, God, next the Word, and the Spirit with them. They are equally eternal, and make but one whoſe power will never end. But thou, mortal, go hence, and think that the end of the life of man is uncertain."

Van Dale, in his treatiſe of oracles, does not believe that they ceaſed at the coming of Chriſt. He relates ſeveral examples of oracles conſulted till the death of Theodoſius the Great. He quotes the laws of the emperors Theodoſius, Gratian, and Valentinian, againſt thoſe who conſulted oracles, as a certain proof that the ſuperſtition of oracles ſtill ſubſiſted in the time of thoſe emperors.

According to others, the opinion of thoſe who believe that demons had no ſhare in the oracles, and that the coming of the Meſſiah made no change in them, and the contrary opinion of thoſe who pretend that the incarnation of the Word impoſed a general ſilence on all oracles, ſhould be equally rejected. They allege, that two ſorts of oracles ought to be diſtinguiſhed: the one dictated by the ſpirits of darkneſs, who deceived men by their obſcure and doubtful anſwers; the other, the pure artifice and cheat of the prieſts of falſe divinities. As to the oracles given out by demons, the reign of Satan was deſtroyed by the coming of the Saviour; truth ſhut the mouth of lies; but Satan continued his old craft among idolaters. All the devils were not forced to ſilence at the ſame time by the coming of the Meſſiah; it was on particular occaſions that the truth of Chriſtianity, and the virtue of Chriſtians, impoſed ſilence on the devils. St Athanaſius tells the Pagans, that they have been witneſſes themſelves that the ſign of the croſs puts the devils to flight, ſilences oracles, and diſſipates enchantments. This power of ſilencing oracles, and putting the devils to flight, is alſo atteſted by Arnobius, Lactantius, Prudentius, Minutius Felix, and ſeveral others. Their teſtimony is a certain proof that the coming of the Meſſiah had not impoſed a general ſilence on oracles.

Plutarch relates, that the pilot Thamus heard a voice in the air, crying out, "The great Pan is dead;" whereupon Euſebius obſerves, that the accounts of the death of the demons were frequent in the reign of Tiberius, when Chriſt drove out the wicked ſpirits.

The ſame judgment, it is ſaid, may [illegible] on oracles as on *[illegible]*. It was on [illegible] ſions, by the divine permiſſion, that the [illegible] out devils, or ſilenced oracles, in the [illegible] and even by the confeſſion, of the Pagans themſelves. And thus it is we ſhould, it ſeems, underſtand the paſſages of St Jerome, Euſebius, Cyril, Theodoret, Prudentius, and other authors, who ſaid that the coming of Chriſt had impoſed ſilence on the oracles.

As to the ſecond ſort of oracles, which were pure artifices and cheats of the prieſts of falſe divinities, and which probably exceeded the number of thoſe that immediately proceeded from demons, they did not ceaſe till idolatry was aboliſhed, though they had loſt their credit for a conſiderable time before the coming of Chriſt. It was concerning this more common and general ſort of oracles that Minutius Felix ſaid, they began to diſcontinue their reſponſes, according as men began to be more polite. But, however oracles were decried, impoſtors always found dupes, the groſſeſt cheats having never failed.

Daniel diſcovered the impoſture of the prieſts of Bel, who had a private way of getting into the temple to take away the offered meats, and who made the king believe that the idol conſumed them.—Mundus, being in love with Paulina, the eldeſt of the prieſteſſes of Iſis, went and told her, that the god Anubis, being paſſionately fond of her, commanded her to give him a meeting. She was afterwards ſhut up in a dark room, where her lover Mundus, whom ſhe believed to be the god Anubis, was concealed. This impoſture having been diſcovered, Tiberius ordered thoſe deteſtable prieſts and prieſteſſes to be crucified, and with them Idea, Mundus's free woman, who had conducted the whole intrigue. He alſo commanded the temple of Iſis to be levelled with the ground, and her ſtatue to be thrown into the Tiber; and, as to Mundus, he contented himſelf with ſending him into baniſhment.

Theophilus, biſhop of Alexandria, not only deſtroyed the temples of the falſe gods, but diſcovered the cheats of the prieſts, by ſhowing that the ſtatues, ſome of which were of braſs, and others of wood, were hollow within, and led into dark paſſages made in the wall.

Lucian, in diſcovering the impoſtures of the falſe prophet Alexander, ſays, that the oracles were chiefly afraid of the ſubtilties of the Epicureans and Chriſtians. The falſe prophet Alexander ſometimes feigned himſelf ſeized with a divine fury, and by means of the herb ſopewort, which he chewed, frothed at the mouth in ſo extraordinary a manner, that the ignorant people attributed it to the ſtrength of the god he was poſſeſſed by. He had long before prepared a head of a dragon made of linen, which opened and ſhut its mouth by means of a horſe hair. He went by night to a place where the foundations of a temple were digging: and having found water, either of a ſpring, or rain that had ſettled there, he hid in it a gooſe egg, in which he had encloſed a little ſerpent that had been juſt hatched. The next day, very early in the morning, he came quite naked into the ſtreet, having only a ſcarf about his middle, holding in his hand a ſcythe, and toſſing about his hair as the prieſts of Cybele; then getting a-top of a high altar, he ſaid, that the place [illegible] happy to be honoured by the birth of a god. Afterwards, running down to the place where he [illegible] gooſe egg, and going into the water, [illegible] ſing the praiſes of Apollo and Æſculapius, and to invite the latter to come and ſhow himſelf to men. With theſe words, he [illegible] bowl into the [illegible] and takes out the [illegible] egg, which had a god encloſed in it; and when he had it in his hand, he began to ſay that he held Æſculapius. Whilſt all were eager to have a ſight of this fine myſtery, he broke the egg, and the little ſerpent ſtarting out, twiſted itſelf about his fingers.

Theſe examples ſhow clearly, that both Chriſtians and Pagans were ſo far agreed as to treat the *greater number* of oracles as purely human impoſtures. That, in fact, ALL of them were ſo, will be concluded by thoſe who give equal credit to demoniacal *inſpiration*, and demoniacal *poſſeſſion*. The moſt ancient oracle was that of Dodona (ſee DODONA); but the moſt famous was that of Delphi, to which article we alſo refer for further particulars on this ſubject, ſo famous in Pagan antiquity. Another celebrated one was the oracle of Trophonius, in the neighbourhood of Lebadia, a city of Bœotia, which was held in high eſtimation. It received its name from Trophonius, brother of Agamedes, who lived in a ſubterraneous dwelling near Lebadia, and pretended to the faculty of foretelling future events. He died in his cave, and was deified as an oracular god. This oracle owed its reputation to one Saon.

Thoſe who repaired to this cave for information, were required to offer certain ſacrifices, to anoint themſelves with oil, and to bathe in a certain river: They were then clothed in a linen robe, took a honeyed cake in their hands, and deſcended into the ſubterraneous chamber by a narrow paſſage. Here it was that futurity was unfolded to them, either by viſions or extraordinary ſounds. The return from the cave was by the ſame paſſage, but the perſons conſulting were obliged to walk backwards. They generally came out aſtoniſhed, melancholy, and dejected; hence the proverb εις Τροφωνιου μεμαντευται. The prieſts on their return placed them on an elevated ſeat, called *the ſeat of Mnemoſyne*, where an account was taken of what they had ſeen and heard. They were then conducted to the chapel of good Genius by their companions, where, by degrees, they recovered their uſual compoſure and cheerfulneſs.

Beſides theſe three principal oracles of Greece, it is proper to take notice of that of Amphiaraus at Oropius in Attica. It was ſo called from Amphiaraus, the ſon of Oicleus, a man ſkilled in magic, the interpretation of dreams, &c. and who after his death was deified and delivered oracles in a temple erected to his divinity. (See AMPHIARAUS.) They who applied to him for information, were to purify themſelves, offer ſacrifice, faſt twenty-four hours, abſtain from wine two days, and make an offering of a ram to Amphiaraus; on the ſkin of which they were to ſleep, and ſee their deſtiny in a dream. Near the temple was Amphiaraus's fountain, which was ſacred, and the waters of it forbidden to be uſed for ordinary purpoſes.

At Delos alſo there was an oracle of the Delian Apollo: in Mileſia was that of the Branchidæ, with others of leſs note, which require not a particular deſcription, ſuch as that of the camps at Lacedæmon, that of Nabarcha, that of Chryſopolis, that of Claros in Ionia, that of Mallos, that of Patarea, that of Pella, that of Phaſellides, that of Sinope, that of Orpheus's head, &c.

Though the Romans conſulted the Grecian oracles upon many occaſions, and had few oracles in their own country; yet we muſt not omit mentioning the Cumæan oracles, which were delivered by the Sibyl of Cumæ. For an account of the Sibyls, See the article SIBYL. See alſo DÆMON and DÆMONIAC.

We have hitherto only conſidered the oracles of falſe gods, of which there was a far greater number than our limits permit us to obſerve, and before either Greeks or Romans had riſen to any diſtinction. Oracle is in ſacred hiſtory ſometimes uſed for the mercy ſeat, or the cover of the ark of the covenant; and by others it is taken for the ſanctuary, or for the moſt holy place, wherein the ark was depoſited.

Among the Jews we may diſtinguiſh ſeveral ſorts of *real* oracles. They had firſt oracles that were delivered *viva voce;* as when God ſpake to Moſes face to face, and as one friend ſpeaks to another, (Numb. xii. 8.) Secondly, Prophetical dreams ſent by God; as the dreams which God ſent to Joſeph, and which foretold his future greatneſs. (Gen. xxxvii. 5, 6.) Thirdly, Viſions; as when a prophet in an ecſtaſy, being neither properly aſleep nor awake, had ſupernatural revelations, (Gen. xv. 1. xlvi. 2.) Fourthly, The oracle of Urim and Thummim, which was accompanied with the ephod or the pectoral worn by the high prieſt, and which God had endued with the gift of foretelling things.

things to come, (Numb. xii. 6. Joel ii. 28.). This manner of inquiring of the Lord was often made uſe of, from Joſhua's time to the erection of the temple at Jeruſalem. Fifthly, After the building of the temple, they generally conſulted the prophets, who were frequent in the kingdoms of Judah and Iſrael. From Haggai, Zechariah, and Malachi, who are the laſt of the prophets that have any of their writings remaining, the Jews pretend that God gave them what they call *Bathcol*, the daughter of the voice, which was a ſupernatural manifeſtation of the will of God, which was performed either by a ſtrong inſpiration or internal voice, or elſe by a ſenſible and external voice, which was heard by a number of perſons ſufficient to bear teſtimony of it. For example, ſuch was the voice that was heard at the baptiſm of Jeſus Chriſt, ſaying, This is my beloved Son, &c. (Matth. iii. 17.)

The Scripture affords us examples likewiſe of profane oracles. Balaam, at the inſtigation of his own ſpirit, and urged on by his avarice, fearing to loſe the recompenſe that he was promiſed by Balak king of the Moabites, ſuggeſts a diabolical expedient to this prince, of making the Iſraelites fall into idolatry and fornication (Numb. xxiv. 14. xxxi. 16.), by which he aſſures him of a certain victory, or at leaſt of conſiderable advantage againſt the people of God.

Micaiah the ſon of Imlah, a prophet of the Lord, ſays (1 Kings xxii. 21, &c.), that he ſaw the Almighty ſitting upon his throne, and all the hoſt of heaven round about him; and the Lord ſaid, who ſhall tempt Ahab king of Iſrael, that he may go to war with Ramoth-gilead, and fall in the battle? One anſwered after one manner, and another in another. At the ſame time an evil ſpirit preſented himſelf before the Lord and ſaid, I will ſeduce him. And the Lord aſked him, How? To which Satan anſwered, I will go and be a lying ſpirit in the mouth of his prophets. And the Lord ſaid, Go and thou ſhalt prevail. This dialogue clearly proves theſe two things, *firſt*, that the devil could do nothing by his own power; and, *ſecondly*, that with the permiſſion of God, he could inſpire the falſe prophets, ſorcerers, and magicians, and make them deliver falſe oracles.

Reſpecting the ceſſation of profane oracles there have been a variety of opinions; ſome of which we have already remarked. It has been generally held, indeed, that oracles ceaſed at the birth of Jeſus Chriſt: Yet ſome have endeavoured to maintain the contrary, by ſhowing that they were in being in the days of Julian, commonly called *the Apoſtate*, and that this emperor himſelf conſulted them; nay, farther, ſay they, hiſtory makes mention of ſeveral laws publiſhed by the Chriſtian emperors Theodoſius, Gratian, and Valentinian, to puniſh perſons who interrogated them, even in their days; and that the Epicureans were the firſt who made a jeſt of this ſuperſtition, and expoſed the roguery of its prieſts to the people. As we ſuſpect moſt of the facts here aſſerted ſhould be underſtood in a qualified ſenſe, we ſhall endeavour to diſcuſs this point of controverſy in as few words as poſſible, although it is undoubtedly a matter of ſome conſequence.

1ſt, The queſtion, properly ſtated, is not, Whether oracles became extinct *immediately upon the birth of Chriſt*, or from the very moment he was born? but, If they fell gradually into diſeſteem and ceaſed, as Chriſt and his goſpel became known to mankind? And that they did ſo, is moſt certain from the concurrent teſtimonies of the fathers, which, whoever would endeavour to invalidate, may equally give up the moſt reſpectable traditions and relations of every kind.

2dly, But did not Julian the apoſtate conſult theſe oracles? We anſwer in the negative: he had indeed recourſe to magical operations, but it was becauſe oracles had already ceaſed; for he bewailed the loſs of them, and aſſigned pitiful reaſons for it; which St Cyril has vigorouſly refuted, adding, that *he never could have offered ſuch, but from an unwillingneſs to acknowledge, that when the world had received the light of Chriſt, the dominion of the devil was at an end.*

3dly, The Chriſtian emperors do indeed ſeem to condemn the ſuperſtition and idolatry of thoſe who were ſtill for conſulting oracles; but the edicts of thoſe princes do not prove that oracles actually exiſted in their times, any more than that they ceaſed in conſequence of their laws. It is certain that they were for the moſt part extinct before the converſion of Conſtantine.

4thly, Some Epicureans might *make a jeſt of this ſuperſtition*: however the Epicurean philoſopher Celſus, in the ſecond century of the church, was for crying up the excellency of ſeveral oracles, as appears at large from Origen's ſeventh book againſt him.

ORÆA, certain ſolemn ſacrifices of fruits which were offered in the four ſeaſons of the year, in order to obtain mild and temperate weather. They were offered to the goddeſſes who preſided over the ſeaſons, who attended upon the ſun, and who received divine worſhip at Athens.

ORAL, ſomething delivered by word of mouth, without being committed to writing; in which ſenſe we ſay oral law, oral tradition, &c.

ORAN, a very ſtrong and important town of Africa, in Barbary, and in the kingdom of Tremecen, with ſeveral forts, and an excellent harbour. It is ſeated partly on the ſide of a hill, and partly on a plain, about a ſtonecaſt from the ſea, almoſt oppoſite to Carthagena in Spain. It is about a mile and a half in circumference, and well fortified, but commanded by the adjacent hills. It was taken by the Spaniards in 1509, and retaken by the Algerines in 1708; but in 1732 the Spaniards became maſters it, and have continued ſo ever ſince. E. Long. 0. 8. N. Lat. 36. 2.

ORANG OUTANG. See SIMIA. Alſo COMPARATIVE ANATOMY, p. 250. Ch. I. ſect. 2.

ORANGE, a famous city, and capital of a province of the ſame name, united to Dauphiny, with a univerſity and a biſhop's ſee, ſuffragan of Arles. It is ſeated in a fine large plain, watered by a vaſt number of little rivulets on the eaſt ſide of the river Rhone. It is a very large ancient place, and was conſiderable in the time of the Romans, who adorned it with ſeveral buildings of which there are ſtill ſome ruins left, particularly of an amphitheatre, and a triumphal arch, which is almoſt entire, dedicated to Marius. This town was formerly much larger than it is at preſent, as appears from the traces of the ancient walls. The wall was in 1682 entirely demoliſhed by order of Louis XIV. and the inhabitants were expoſed to the fury of the ſoldiers. The town was reſtored to King William by the treaty of Ryſwick; but after his death the French took it again, and expelled the Proteſtant inhabitants. By the treaty of Utrecht it was confirmed to the crown of France, though the title is ſtill retained in the houſe of Naſſau. The title was firſt introduced into the family of Naſſau, by the marriage of Claude de Chalons, the prince of Orange's ſiſter, with the count of Naſſau, 1530. The principality is a very ſmall diſtrict, it being only twelve miles in length and nine in breadth, and the revenue amounts to about 5000l. a-year. The country is pleaſant, and abounds with corn and fruit, but is expoſed to violent winds. E. Long. 4. 49. N. Lat. 44. 9.

Maurice Prince of ORANGE. See MAURICE.

ORANGE-*Tree*, in botany. See the article CITRUS.—Orange-flowers are juſtly eſteemed one of the fineſt perfumes: and though little uſed in medicine, yet the water diſtilled from them is accounted ſtomachic, cordial, and carminative. The fruit is cooling, and good in feveriſh diſorders, and particularly in diarrhœas. Orange-peel is an agreeable aromatic, proper to repair and ſtrengthen the ſtomach, and gives a very grateful flavour to any infuſions or tinctures into whoſe compoſitions it enters. It is particularly uſeful in preparations of the bark: gives an agreeable warmth to the infuſion; and, according to Dr Percival, conſiderably increaſes its virtue.

In the Philoſophical Tranſactions, Nº 114. there is a very remarkable account of a tree ſtanding in a grove near Florence, having an *orange* ſtock, which had been ſo grafted upon, that it became in its branches, leaves, flowers, and fruit, three-formed: ſome emulating the orange, ſome the lemon or citron, and ſome partaking of both forms in one; and what was very remarkable, was, that theſe mixed fruits never produced any perfect ſeeds: ſometimes there were no ſeeds at all in them, and ſometimes only a few empty ones.

ORANGE-*Peel*. See CITRUS and ORANGE-*Tree*.

ORANGE-*Dew*, a kind of dew which falls in the ſpring time from the leaves of orange and lemon trees, which is extremely fine and ſubtile. M. de la Hire obſerving this, placed ſome flat pieces of glaſs under the leaves to receive it; and having procured ſome large drops of it, was deſirous of diſcovering what it was. He ſoon found that it was not a merely aqueous fluid, becauſe it did not evaporate in the air; and that it was not a reſin, becauſe it readily and perfectly mixed with water: it was natural then to ſuppoſe it a liquid gum; but neither did this, on examination, prove to be the caſe; for being laid on paper, it did not dry as the other liquid gums do. Its anſwering to none of theſe characters, and its being of the conſiſtence of honey, and of a ſweet ſugar-like taſte, gave a ſuſpicion of its being a kind of manna; and whatever in the other trials had proved it not a reſin, a gum, &c. all equally tends to prove that it is this ſubſtance.

ORANGE, *Sea*, in natural hiſtory, a name given by Count Marſigli to a very remarkable ſpecies of marine ſubſtance, which he denominates a *plant*. It is tough and firm in its ſtructure, and in many things reſembles the common fucus; but inſtead of growing in the branched form which the generality of thoſe ſubſtances have, it is round and hollow, and in every reſpect reſembles the ſhape of an orange. It has, by way of root, ſome exceeding fine filaments, which faſten themſelves to the rocks, or to ſhells, ſtones, or any thing elſe that comes in the way. From theſe there grows no pedicle; but the body of the orange, as it is called, is faſtened by them to the rock, or other ſolid ſubſtance. The orange itſelf is uſually of about three or four inches in diameter; and while in the ſea, is full of water, and even retains it when taken up. In this ſtate it frequently weighs a pound and a half; but when the water is let out, and it is dried, it becomes a mere membrane, weighing ſcarce any thing. It is beſt preſerved, by ſtuffing it with cotton as ſoon as the water is let out of it, and then hanging it up to dry. Its ſurface is irregular and rough, and its colour a duſky green on the outſide, and a clearer but ſomewhat bluiſh green within; and its thickneſs is about an eighth part of an inch. When viewed by the microſcope, it is ſeen to be all over covered with ſmall glandules, or rather compoſed of them; for they ſtand ſo thick one by another as to leave no ſpace between, and ſeem to make up the whole ſubſtance; ſo that it appears very like the rough ſhagreen ſkin uſed to cover toys. Theſe are indeed ſo many hollow ducts, through which the ſea water finds a paſſage in the globe formed by this ſkin, and by this means it is kept always full and diſtended; on cutting it with a pair of ſciſſars, the water immediately runs out, and the ſkins collapſe; but there is ſomething extremely remarkable in this, for the whole ſubſtance, near the wounded place, is in motion, and ſeems as if alive, and ſenſible of the wound. The glandules are found full of water, and reſembling ſmall tranſparent bottles; and what goes to the ſtructure of the plant beſide theſe, is an aſſemblage of a vaſt number of filaments, all which are likewiſe hollow, and filled with a clear and tranſparent fluid.

Marſigli, *Hiſt. de la Mer.*

There is another ſubſtance of this kind, mentioned and deſcribed by Count Marſigli, Triumfetti, and others, and called the *ramoſe* or branched orange. This is very much of the nature of the former; but, inſtead of conſiſting of one round globule, it is formed of ſeveral oblong ones, all joined together, and repreſenting the branches of ſome of the fucuſes, only they are ſhorter; and theſe are all hollow and full of water, in the ſame manner as the ſingle globes of the common kind. This has, by way of root, certain fine and ſlender filaments, which faſten it to the ſtones or ſhells near which it is produced; and it is of a duſky greeniſh colour on the ſurface, and of a fine bluiſh green within. The ſurface, viewed by the microſcope, appears rough, as in the other, and the glandules are of the ſame kind, and are always found full of clear water. See CORALLINES.

ORATION, in rhetoric, a ſpeech or harangue, compoſed according to the rules of oratory, but ſpoken in public. Orations may be reduced to three kinds, viz. the demonſtrative, deliberative, and judicial. To the demonſtrative kind belong panegyrics, genethliaca, epithalamia, congratulations, &c. To the deliberative kind belong perſuaſion, exhortation, &c. And to the judicial kind belong accuſation, confutation, &c.

Funeral ORATION. See FUNERAL *Oration*.

ORATOR, among the Romans, differed from a *patronus*: The latter was allowed only to plead cauſes on behalf of his clients; whereas the former might quit the forum and aſcend the roſtra or tribunal, to harangue the ſenate or the people. The orators had profound knowledge of the law, but they were eloquent, and their ſtyle was generally correct and conciſe. They were employed in cauſes of importance, inſtead of the common patrons. Orators in the violence of elocution uſed all the warmth of geſture, and even walked backwards and forwards with great heat and emotion. This it was which occaſioned a witticiſm of Flavius Virginius, who aſked one of thoſe walking orators, *Quot millia paſſuum declamaſſet?* "How many MILES he had declaimed?" Similar to the Roman orators were the Grecian *Rhetores*. See RHETORES.

Public ORATOR, an office of very conſiderable dignity, and of ſome emolument in the Engliſh univerſities.

The public orator is the principal, and in many caſes the only oſtenſible, agent for the univerſity in all thoſe matters or forms which are merely external. He carries on or ſuperintends all correſpondences which are calculated to promote the dignity, or raiſe the utility, of the ſeminary which conſtitutes him. He has little to do, indeed, with the internal government of the body, for which a variety of officers in different departments are appointed; but in all public affairs he is, as it were, the mouth of the whole; putting their deliberations into proper form, and communicating or publiſhing them, according to the intention of the univerſity. Thus, if the whole univerſity, or a committee appointed by them, or by ſtatute, or by the will of any particular benefactor, have, after a comparative trial, adjudged a prize to any perſon or perſons, it is the buſineſs of the public orator to inform the ſucceſsful parties of the iſſue of the trial. Again, If for ſingular learning, or for any remarkable *good will* ſhown to the univerſity by any perſon or perſons, the *ſenate* or *convocation* are pleaſed to declare their grateful ſenſe of it either by conferring degrees, or otherwiſe as they think fit, the public orator is to notify this intention to the perſon or perſons concerned; and ſo in other caſes.

Another part of the public orator's buſineſs is to preſent young noblemen, or thoſe who take *honorary* degrees, *tanquam nobiles*, to the vice chancellor: this he does in a Latin ſpeech, which, according to circumſtances, is either ſhort or long; and of which the ſubject is generally a defence of that particular ſtatute which allows the ſons of noblemen, and ſome few others, to proceed to degrees before what is called the *ſtatutable time*. In doing this, encomiums, often ſtronger than juſt, are made upon the learning and virtue of the noble candidate; a view is taken of the dignity of his ancient houſe; the honour is mentioned which has accrued to the univerſity from the acceſſion of ſuch a member; and the oration concludes with promiſing great credit from his future conduct, as well as benefit from the influence of his rank in the ſtate. Theſe circumſtances are deemed ſufficient grounds for exempting the ſons of noblemen from that tedious courſe of ſtudy through which the duller ſons of commoners muſt all paſs before they be thought worthy of academical honours.

ORATORIO, in the Italian muſic, a ſort of ſacred drama of dialogues; containing recitativos, duettos, trios, ritornellos, choruſes, &c. The ſubjects of thoſe pieces are uſually taken from Scripture, or the life of ſome ſaint, &c. The muſic for the oratorios ſhould be in the fineſt taſte and beſt choſen ſtrains. Theſe oratorios are greatly uſed at Rome in the time of Lent, and of late in England.

Meneſtrier attributes the origin of oratorios to the cruſades, and ſays that the pilgrims returning from Jeruſalem and the Holy Land, &c. compoſed ſongs reciting the life and death of the Son of God, and the myſteries of the Chriſtian faith, and celebrating the achievements and conſtancy of ſaints and martyrs. Others, with more probability, obſerve, that the oratorio was an avowed imitation of the opera, with only this difference, that the foundation of it was always [illegible] religious, or at leaſt ſome moral ſubject. Creſcimbeni aſcribes its origin [illegible] Filippo Neri, who was born at Florence in 1515, [illegible] his chapel, after ſermons, and other devotions, [illegible] to allure young people to pious offices, [illegible] pſalms, and ſuch like prayers, ſung by one [illegible] voices. Among theſe ſpiritual ſongs were dialogues; [illegible] theſe entertainments becoming more frequent, and improving every year, were the occaſion that in the ſeventeenth century oratorios were firſt invented, ſo called from the [illegible] origin. See *Hawkins's Hiſtory of Muſic*.

O R A T O R Y;

THE ART OF SPEAKING WELL UPON ANY SUBJECT, IN ORDER TO PERSUADE.

INTRODUCTION.

§ 1. *Of the Riſe and Progreſs of Oratory.*

THE invention of oratory is by the Egyptians, and the fables of the poets, aſcribed to Mercury. And it is well known, that the Greeks made their deities the authors likewiſe of other arts, and ſuppoſed that they preſided over them. Hence they gave Mercury the titles of Λόγιος and Ἑρμῆς, both which names come from words that ſignify "to ſpeak." And Ariſtides calls eloquence *the gift of Mercury*; and for the ſame reaſon anciently the tongue was conſecrated to him. He was likewiſe ſaid to be the interpreter or meſſenger of the gods; which office very well ſuited him, as he excelled in eloquence. Hence we read in the Sacred Writings, that when the people of Lyſtra took Barnabas and Paul for gods in human ſhape, becauſe of that ſudden and ſurpriſing cure which was wrought upon the lame man, they called Barnabas *Jupiter*, and Paul *Mercury*; for this reaſon, as the inſpired writer tells us, 'becauſe he was the chief ſpeaker,' that is (as the ſpectators then thought), the interpreter or ſpokeſman of Barnabas.

1
The origin of the art of oratory.

But to paſs over theſe fictions of the heathen deities, let us hear what Quintilian ſays of the *origin* of this art; who ſeems to give a very probable account of it in the following paſſage. "The faculty of ſpeech (ſays he) we derive from nature (a); but the art from obſervation. For as in phyſic, men, by ſeeing that ſome things promote health and others deſtroy it, formed the art upon thoſe obſervations; in like manner, by perceiving that ſome things in diſcourſe are ſaid to advantage, and others not, they accordingly marked thoſe things, in order to imitate the one and avoid the other. They alſo added ſome things from their own reaſon and judgment, which being confirmed by uſe, they began to teach others what they knew themſelves." But no certain account can be given when, or by whom, this method of obſervation firſt began to take place. And Ariſtotle ſuppoſes, not without reaſon, that the firſt lineaments of the art were very rude and imperfect. Pauſanias, indeed, in his *Deſcription of Greece*, tells us, that Pittheus, the uncle of Theſeus, taught it at Trœzene a city of Peloponneſus, and wrote a book concerning it; which he read himſelf, as it was publiſhed by one of Epidaurus. But as Pittheus lived about 1000 years before Pauſanias, who flouriſhed in the time of the emperor Hadrian, ſome are of opinion he might be impoſed upon by the Epidaurian, who publiſhed this book under the name of *Pittheus*. But be that as it will, it is very reaſonable to believe, that the Greeks had the principles of this art ſo early as the time of Pittheus. For Theſeus his nephew lived not long before the taking of Troy, which, according to Sir Iſaac Newton, happened 904 years before the birth of Chriſt; at which time Cicero thought it was in much eſteem among them. "Homer (ſays he) would never have given Ulyſſes and Neſtor in the Trojan war ſo great commendations on account of their ſpeeches (to one of whom [illegible] attributes force, and to the other ſweetneſs) [illegible] eloquence had even in thoſe times been [illegible] repute." And leſt any one ſhould imagine [illegible] thoſe days they made uſe only of ſuch [illegible] and practice could afford them, the ſame [illegible] us, that Peleus ſent Phœnix with his [illegible] Achilles to the Trojan war, to inſtruct him not only in the art of war, but likewiſe of eloquence. But who were the profeſſors of this art for ſome ages following is not known. For Quintilian ſays, that afterwards Empedocles is the firſt upon record who attempted any thing concerning it. And he, by Sir Iſaac Newton's account, flouriſhed about 500 years after Troy was taken. At which time, as Cicero obſerves, men being now ſenſible of the powerful charms of oratory, and the influence it had upon the mind, there immediately aroſe ſeveral maſters of it; the chief of whom are mentioned by Quintilian, who tells us, that 'the oldeſt writers upon this art are Corax and Tiſias, both of Sicily. After them came Gorgias of Leontium in the ſame iſland, who is ſaid to have been the ſcholar of Empedocles, and by reaſon of his great age (for he lived to be 109 years old) had many cotemporaries. Thraſymachus of Chalcedon, Prodicus of Cea, Protagoras of Abdera, Hippias of Elis, and Alcidamus of Elea, lived in his time; as likewiſe Antiphon, who firſt wrote orations, and alſo upon the art, and is ſaid to have ſpoken admirably well in his own defence; and beſides theſe, Polycrates, and Theodore of Byzantium.' Theſe perſons contributed different ways towards the improvement of the art. Corax and Tiſias gave rules for methodizing a diſcourſe, and adjuſting its particular parts; as may be conjectured from Cicero's account of them, who ſays, "Though ſome had ſpoke well before their time, yet none with order and method." But Gorgias ſeems to have excelled all the reſt in fame and reputation: for he was ſo highly applauded by all Greece, that a golden ſtatue was erected to him at Delphos, which was a diſtinguiſhing honour conferred upon him only. And he is ſaid to have been ſo great a maſter of oratory, that in a public aſſembly he would undertake to declaim immediately upon any ſubject propoſed to him. He wrote, as Cicero informs us, in the demonſtrative or laudatory way; which requires moſt of the ſublime, and makes what Diodorus Siculus ſays of him the more probable, that "he firſt introduced the ſtrongeſt figures, members of periods oppoſite in ſenſe, of an equal length, or ending with a like ſound, and other ornaments of that nature." And hence thoſe figures, which give the greateſt force and luſtre to a diſcourſe, were anciently called by his name. Cicero tells us further, that Thraſymachus and Gorgias were the firſt who introduced numbers into proſe, which Iſocrates afterwards brought to perfection. Quintilian likewiſe mentions Protagoras, Gorgias, Prodicus, and Thraſymachus, as the firſt who treated of common places, and ſhowed the uſe of them for the invention of arguments. Nor muſt we omit Plato, whoſe elegant dialogue upon this ſubject is ſtill extant, which he entitles *Gorgias*. For though he does not lay down the common rules of the art; yet he very well explains the nature of it, and maintains its true end and uſe againſt the generality of its profeſſors, who had greatly perverted the original deſign of it. Thus by the ſtudy and induſtry of ſo many ingenious and great men, the art of oratory was then carried to a conſiderable height among the Grecians: though many of thoſe who profeſſed it in thoſe times employed their ſkill rather to promote their own reputation and applauſe, than to ſerve the real intereſts of truth and virtue. "For they propoſed in an arrogant manner (as Cicero ſays) to teach how a bad cauſe might be ſo managed, as to get the better of a good one." That is, they would undertake to charm the ears and ſtrike the paſſions of their hearers in ſo powerful a manner, by ſophiſtical reaſonings, turns of wit, and fine language, as to impoſe falſehood upon them for truth; than which nothing could be either more diſingenuous in itſelf, or prejudicial to ſociety.

a Orators of Greece.

But thoſe who ſucceeded them ſeem to have conſulted better, both for their own honour and that of their profeſſion. Iſocrates was the moſt renowned of all

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(a) If Quintilian meant that the human race ſpeak an articulate language by nature or inſtinct, he certainly deceived himſelf (ſee LANGUAGE); but if his meaning was only that men have from nature a capability of ſpeech, the obſervation is true, but not of much value. Parrots and other birds have a capability of uttering articulate ſounds.

all Gorgias's ſcholars, whom Cicero frequently extols with the higheſt commendations, as the greateſt maſter and teacher of oratory; "whoſe ſchool (as he ſays) like the Trojan horſe, ſent forth abundance of great men." Ariſtotle was chiefly induced to engage in this province from an emulation of his glory; and would often ſay in a verſe of Sophocles, ſomewhat varied to his purpoſe,

> To be ſilent it is a ſhame;
> While Iſocrates gets ſuch fame.

Quintilian ſays they both wrote upon the art, though there is no ſyſtem of the former now extant. But that of Ariſtotle is eſteemed the beſt and moſt complete of any in the Greek language. In this age the Grecian eloquence appeared in its higheſt perfection. Demoſthenes was a hearer both of Iſocrates and Plato, as alſo of Iſæus (ten of whoſe orations are yet extant); and by the aſſiſtance of a ſurpriſing genius, joined with indefatigable induſtry, made that advantage of their precepts, that he has been always eſteemed by the beſt judges the prince of Grecian orators. His great adverſary and rival Æſchines, after his baniſhment, is ſaid to have gone to Rhodes, and employed his time there in teaching of rhetoric. Theodectes and Theophraſtus, both of them ſcholars of Ariſtotle, imitated their maſter in writing upon the art. And from that time the philoſophers, eſpecially the Stoics and Peripatetics, applied themſelves to lay down the rules of oratory; which Socrates had before ſeparated from the province of a philoſopher. And there is yet preſerved a treatiſe upon this ſubject, which ſome have aſcribed to Demetrius Phalereus the Peripatetic, and ſcholar of Theophraſtus, though others more probably to Dionyſius of Halicarnaſſus. Quintilian mentions ſeveral other famous rhetoricians in the following ages, who were likewiſe writers: As Hermagoras, Athenæus, Apollonius Molon, Areus Cæcilius, Dionyſius of Halicarnaſſus, Apollonius of Pergamus, and Theodore of Gadara. But of theſe nothing now remains upon the ſubject of oratory, except ſome tracts of Dionyſius, who flouriſhed in the reign of Auguſtus Cæſar. Nor have there been wanting ſome eminent writers of this kind among the Greeks ſince the time of Quintilian; two of whom we cannot omit to mention, Hermogenes, and Longinus the author of the incomparable treatiſe *Of the Sublime*, a book which can ſcarce be too much commended or too often read.

3 Riſe and progreſs of oratory in Rome.

It was long before Rome received this art, and not without difficulty at firſt. The reaſon was, becauſe the Romans were for ſeveral ages wholly addicted to military affairs, and to enlarge their territories; ſo that they not only neglected to cultivate learning, but thought the purſuit of it a thing of ill tendency, by diverting the minds of their youth from the cares and toils of war, to a more ſoft and indolent kind of life. Therefore ſo late as the year of their city 592, when by the induſtry of ſome Grecians the liberal arts began to flouriſh in Italy, a decree paſſed the ſenate, by which all philoſophers and rhetoricians were ordered to depart out of Rome. But in a few years after, when Carneades, Critolaus, and Diogenes, who were not only philoſophers but orators, came ambaſſadors from Athens to Rome, the Roman youth were ſo charmed with the eloquence of their harangues, that they could no longer be ſtopt from purſuing the ſtudy of oratory. And by a further acquaintance with the Greeks, it ſoon gained ſuch eſteem, that perſons of the firſt quality employed their time and pains to acquire it. And a young gentleman, who was ambitious to advance himſelf in the ſervice of his country, could have little hopes of ſucceſs, unleſs he had laid the foundation of his future proſpects in that ſtudy.

Seneca tells us, that Lucius Plotius, a Gaul, was the firſt who taught the art of oratory at Rome in Latin; which, Cicero ſays, was while he was a boy; and when the moſt ſtudious perſons went to hear him, he lamented that he could not go with them; being prevented by the regard he paid to the opinion of ſome of his friends, who thought that greater improvements were made by exerciſes in the Greek language under Grecian maſters. Seneca adds, that this profeſſion continued for ſome time in the hands of freedmen; and that the firſt Roman who engaged in it was Blandus of the equeſtrian order, who was ſucceeded by others; ſome of whoſe lives are yet extant, written by Suetonius, as many of the Grecians are by Philoſtratus and Eunapius. Quintilian likewiſe gives us the names of thoſe among the Romans, who wrote upon the art. "The firſt (ſays he), as far as I can learn, who compoſed any thing upon this argument, was M. Cato the cenſor. After him Antony the orator began upon the ſubject, which is the only work he has left, and that imperfect. Then followed ſome of leſs note. But he who carried eloquence to its higheſt pitch among us, was Cicero; who has likewiſe by his rules given the beſt plan both to practiſe and teach the art. After whom modeſty would require us to mention no more, had he not told us himſelf that his books of rhetoric ſlipt out of his hands, while he was but a youth. And thoſe leſſer things, which many perſons want, he has purpoſely omitted in his diſcourſes of oratory. Cornificius wrote largely upon the ſame ſubject; Stertinius and Gallio the father, each of them ſomething. But Celſus and Lenas were more accurate than Gallio; and in our times Virginius, Pliny, and Rutilius. And there are at this day ſome celebrated authors of the ſame kind, who, if they had taken in every thing, might have ſaved my pains." Time has ſince deprived us of moſt of the writers mentioned here by Quintilian. But we have the leſs reaſon to regret this loſs, ſince it has preſerved to us Cicero's treatiſes upon this ſubject; which we may well ſuppoſe to have been chiefly owing to their own excellency, and the great eſteem they have always had in the world. Beſides his *Two books of Invention*, which Quintilian here calls his *Books of Rhetoric*, there are extant of his, *Three books of an Orator*; one *Of famous Orators*; and another, which is called *The Orator*; as alſo his *Topics*, a preface *Concerning the beſt ſort of Orators*, and a treatiſe *Of the parts of Oratory*. Each of which treatiſes, whether we regard the juſtneſs and delicacy of the thoughts, the uſefulneſs of the rules, or the elegance and beauty of the ſtyle, deſerves to be frequently peruſed by all who are lovers of eloquence. For who can be thought ſo well qualified to give the rules of any art, as he who excelled all mankind in the practiſe of them? But thoſe *Four books to Herennius*, which are publiſhed among Cicero's works, ſeem with good reaſon to be attributed to Cornificius, whom

Quinctilian here mentions. And Celſus is by ſome affirmed to have taught oratory, whom he alſo places among the rhetoricians, and whoſe *Eight Books of Medicine* are yet extant, written in ſo beautiful a ſtyle as plainly ſhows him to be a maſter of eloquence. But Quintilian himſelf outdid all who went before him in diligence and accuracy as a writer. His *Inſtitutions* are ſo comprehenſive, and written with ſuch great exactneſs and judgment, that they are generally allowed to be the moſt perfect work of the kind. With this excellent author we ſhall finiſh the account of the Latin rhetoricians.

There were indeed ſome others in the following ages, whoſe works are yet extant; but as they contain nothing of moment which is not to be found in thoſe already mentioned, we ſhall forbear to name them. Much leſs ſhall we deſcend to that numerous body of writers, who ſince the revival of learning have treated upon this ſubject, for the ſame reaſon. And a very good judge * has not long ſince given it as his opinion, that the method of forming the beſt ſyſtem of oratory, is to collect it from the fineſt precepts of Ariſtotle, Cicero, Quintilian, Longinus, and other celebrated authors; with proper examples taken from the choiceſt parts of the pureſt antiquity. And this is the method attempted to be purſued in the following treatiſe.

* Archb. Cambray, Lett. p. 213.

§ 2. *Of the Nature of Oratory.*

The terms *rhetoric* and *oratory*, having no other difference but that one is taken from the Greek language and the other from the Latin, may be uſed promiſcuouſly; but the caſe is not the ſame with reſpect to the words *rhetorician* and *orator*. For although the Grecians uſed the former, both to expreſs thoſe who taught the art, and thoſe who practiſed it; yet the Romans afterward, when they took that word into their language, confined it to the teachers of the art, and called the reſt *orators*. And there ſeems to have been a ſufficient reaſon for this diſtinction, ſince the art was the ſame in both, and might therefore go by either name; but the different province of rhetoricians and orators made it not improper that they ſhould be called by different names. Beſides, anciently, before rhetoric was made a ſeparate and diſtinct art from philoſophy, the ſame perſons taught both. And then they were called not only *rhetoricians* but *ſophiſts*. But becauſe they often employed their art rather to vindicate what was falſe and unjuſt, than to ſupport truth and virtue; this diſingenuous conduct by which they frequently impoſed upon weak minds, brought a diſcredit both upon themſelves and their profeſſion. And therefore the name *ſophiſt* or *ſophiſter*, has been more generally uſed in an ill ſenſe, to ſignify one ſkilled rather in the arts of cavilling, than qualified to ſpeak well and accurately upon any ſubject.

It is not neceſſary to uſe many words, to prove that oratory is an art. For it is compriſed under certain rules, agreeable to reaſon, delivered in a regular method, and ſuited to attain the end it propoſes; which are characters ſufficient to denominate it an art. Indeed the caſe is the ſame here as in moſt other things, that a good genius is of itſelf more ſerviceable than the moſt exact acquaintance with all the rules of art, where that is wanting. But it is ſufficient that art help nature, and carry it farther than it can otherwiſe advance without it. And he who is deſirous to gain the reputation of a good orator, will find the aſſiſtance of art very neceſſary. Some perſons have thought, that many of the common ſyſtems written upon the ſubject of oratory have been attended with this inconvenience, that, by burdening the mind with too great a number of rules about things of leſs importance, they have oftentimes rather diſcouraged than promoted the ſtudy of eloquence. This undoubtedly is an extreme which ſhould be always carefully avoided. But, however, an indifferent guide in a ſtrange road is better than none at all. It may be worth while to hear Quintilian's opinion upon this head. "I would not (ſays he) have young perſons think they are ſufficiently inſtructed, if they have learned one of thoſe compends which are commonly handed about, and fancy themſelves ſafe in the decrees, as it were, of theſe technical writers. The art of ſpeaking requires much labour, conſtant ſtudy, a variety of exerciſe, many trials, the greateſt prudence, and readineſs of thought. However, theſe treatiſes are uſeful, when they ſet you in a plain and open way, and do not confine you to one narrow track, from which he who thinks it a crime to depart muſt move as ſlowly as one that walks upon a rope." We ſee he is not for having us confine ourſelves too cloſely to ſyſtems, though he thinks they are of ſervice at firſt, till uſe and experience render them leſs neceſſary.

5 The object of it.

The buſineſs of oratory is to teach us to ſpeak well; which, as Cicero explains it, is to ſpeak *juſtly*, *methodically*, *floridly*, and *copiouſly*.

Now, in order to ſpeak *juſtly*, or pertinently, a perſon muſt be maſter of his ſubject, that he may be able to ſay all that is proper, and avoid whatever may appear foreign and trifling. And he muſt clothe his thoughts with ſuch words and expreſſions as are moſt ſuited to the nature of the argument, and will give it the greateſt force and evidence.

And as it teaches to ſpeak juſtly, ſo likewiſe *methodically*. This requires, that all the parts of a diſcourſe be placed in their proper order, and with ſuch juſt connexion, as to reflect a light upon each other, and thereby to render the whole both clear in itſelf, and eaſy to be retained. But the ſame method is not proper for all diſcourſes. And very frequently a different manner is convenient in handling the ſame ſubject. For it is plain, that art, as well as nature, loves variety; and it diſcovers the ſpeaker's judgment, when the diſpoſition of his diſcourſe is ſo framed, as to appear eaſy and natural, rather than the effect of induſtry and labour.

To ſpeak *floridly*, is ſo peculiar a property of this art, that ſome have wholly confined it to the pomp and ornaments of language. But that it extends farther, and reſpects things as well as words, we ſhall have occaſion to ſhow hereafter. It contains indeed the whole ſubject of elocution, but does not wholly conſiſt in it. True and ſolid eloquence requires not only the beauties and flowers of language, but likewiſe the beſt ſenſe and cleareſt reaſoning. Beſides, rhetoric gives rules for the ſeveral ſorts of ſtyle, and directs the uſe of them agreeably to the nature of the ſubject.

But the force of oratory appears in nothing more than a *copiouſneſs* of expreſſion, or a proper manner of enlargement, ſuited to the nature of the ſubject; which is of great uſe in perſuaſion, and forms the laſt property, required by Cicero, of ſpeaking well. A ſhort and conciſe account of things is often attended with obſcurity, from an omiſſion of ſome neceſſary circumſtances relating to them. Or, however, where that is not the caſe, yet for want of proper embelliſhments to enliven the diſcourſe, and thereby to excite and fix the hearers attention, it is apt to ſlip through their minds without leaving any impreſſion. But where the images of things are drawn in their full proportion, painted in their proper colours, ſet in a clear light, and repreſented in different views, with all the ſtrength and beauties of eloquence, they captivate the minds of the audience with the higheſt pleaſure, engage their attention, and by an irreſiſtible force move and bend them to the deſign of the ſpeaker.

The principal end and deſign of oratory is to perſuade: for which reaſon it is frequently called the *art of perſuaſion*. Indeed the orator has often other ſubordinate views; as when he endeavours either to delight his hearers with what is pleaſant and agreeable, or to conciliate their good opinion by a ſmooth and artful addreſs: but ſtill both theſe are in order to perſuade and excite them to action.

An objection may, perhaps, hence be formed againſt eloquence, as an art which may be employed for perſuading to ill as well as to good. There is no doubt that it may; and ſo reaſoning may alſo be, and too often is, employed for leading men into error. But who would think of forming an argument from this againſt the cultivation of our reaſoning powers? Reaſon, eloquence, and every art which ever has been ſtudied among mankind, may be abuſed, and may prove dangerous in the hands of bad men; but it were perfectly childiſh to contend, that upon this account they ought to be aboliſhed.

While the orator employs his art in purſuing only thoſe ends for which it was at firſt deſigned, the perſuading men to good and virtuous actions, and diſſuading them from every thing that is ill and vicious; nothing can more be commendable in itſelf, or uſeful to human ſocieties.

§ 3. *Of the Diviſion of Oratory.*

6 Oratory conſiſts of four parts.

Oratory conſiſts of four parts; *invention*, *diſpoſition*, *elocution*, and *pronunciation*. This will appear by conſidering the nature of each of them, and what it contributes in forming an orator. Every one who aims to ſpeak well and accurately upon any ſubject, does naturally in the firſt place inquire after and purſue ſuch thoughts as may ſeem moſt proper to explain and illuſtrate the thing upon which he deſigns to diſcourſe. And if the nature of it requires that he ſhould bring reaſons to confirm what he ſays, he not only ſeeks the ſtrongeſt, and ſuch as are like to be beſt received; but alſo prepares to anſwer any thing which may be offered to the contrary. This is *invention*.—After this he deliberates with himſelf in what method to diſpoſe of thoſe things which have occurred to his mind, that they may appear in the plaineſt light, and not loſe their force by diſorder and confuſion. This is the buſineſs of *diſpoſition*.—His next concern is to give his thoughts an agreeable dreſs; by making choice of the fitteſt words, cleareſt expreſſions, ſmooth and harmonious periods, with other ornaments of ſtyle, as may beſt ſuit the nature of his ſubject, brighten his diſcourſe, and render it moſt entertaining to his hearers. And this is called *elocution*.—The laſt thing he attends to, is to deliver what he has thus compoſed, with a juſt and agreeable *pronunciation*. And daily experience convinces us, how much this contributes both to engage the attention and impreſs what is ſpoken upon the mind. This then is the method to which nature directs, in order to qualify ourſelves for diſcourſing to the beſt advantage: Though by cuſtom and habit theſe things become ſo familiar to us, that we do not always attend to them ſeparately in their natural order. However, it is the buſineſs of art to follow nature, and to treat of things in that manner which ſhe dictates.

PART I. OF INVENTION.

Chap. I. *Of Invention in general; and particularly of Common Places, and State of a Cauſe.*

Invention the diſcovery of ſuch things as are fitted to perſuade.

INVENTION, conſidered in general, is the diſcovery of ſuch things as are proper to perſuade. And in order to attain this end, the orator propoſes to himſelf three things: To prove or illuſtrate the ſubject upon which he treats; to conciliate the minds of his hearers; and to engage their paſſions in his favour. And as theſe require different kinds of arguments or motives, invention furniſhes him with a ſupply for each of them, as will be ſhown in their order.

An argument, as defined by Cicero, is a reaſon which induces us to believe what before we doubted of.

And as different kinds of diſcourſes require different arguments, rhetoricians have conſidered them two ways; in general, under certain heads, as a common fund for all ſubjects; and in a more particular manner, as they are ſuited to *demonſtrative*, *deliberative*, or *judicial* diſcourſes. At preſent we ſhall treat only upon the former of theſe. And now, that one thing may receive proof and confirmation from another, it is neceſſary that there be ſome relation between them; for all things are not equally adapted to prove one another. Thus, in meaſuring the quantity of two things which we would ſhow to be either equal or unequal, if they are of ſuch a nature that one cannot be applied to the other, then we take a third thing, which may be applied to them both; and that muſt be equal at leaſt to one of the two, which if applied to the other, and found equal to that alſo, we preſently conclude that theſe two things are equal; but if it be unequal to the other, we ſay that theſe two things are unequal. Becauſe it is the certain and known property of all quantities, that whatſoever two things are equal to a third, are equal to one another; and where one of any two things is equal to a third, and the other unequal, thoſe two things are unequal to one another. What has been ſaid of quantities, will hold true in all other caſes, that ſo far as any two things or ideas agree to a third, ſo far they agree to one another. So likewiſe, on the contrary, as far as one of any two things or ideas does agree to a third, and the other does not, ſo far they diſagree with one another; in which reſpect, one of them cannot be truly affirmed of the other. Since, therefore, in every propoſition, one thing is ſpoken of another, if we would find out whether the two ideas agree to each other or not, where this is not evident of itſelf, we muſt find out ſome third thing, the idea of which agrees to one of them; and then that being applied to the other, as it does agree or diſagree with it, ſo we may conclude, that the two things propoſed do agree or diſagree with one another. This will be made more clear by an example or two. Should it be inquired, *Whether virtue is to be loved;* the argument between virtue and love might be found by comparing them ſeparately with happineſs, as a common meaſure to both. For ſince the idea of happineſs agrees to that of love, and the idea of virtue to that of happineſs; it follows, that the ideas of virtue and love agree to one another: and therefore it may be affirmed, *That virtue is to be loved.* But, on the contrary, becauſe the idea of miſery diſagrees with that of love, but the idea of vice agrees to that of miſery, the two ideas of vice and love muſt conſequently diſagree with one another; and therefore it would be falſe to aſſert, *That vice is to be loved.* Now, this third thing logicians call the *medium,* or *middle term,* becauſe it does as it were connect two extremes; that is, both parts of a propoſition. But rhetoricians call it an *argument,* becauſe it is ſo applied to what was before propoſed, as to become the inſtrument of procuring our aſſent to it. Thus far as to the nature and uſe of arguments. We ſhall next explain by what methods they are to be ſought.

8
Theſe called arguments.

A lively imagination, and readineſs of thought, are undoubtedly a very great help to invention. Some perſons are naturally endued with that quickneſs of fancy, and penetration of mind, that they are ſeldom at a loſs for arguments either to defend their own opinions, or to attack their adverſaries. However, theſe things being the gift of nature, and not to be gained by art, do not properly fall under our preſent conſideration.

9
Learning neceſſary to an orator.

It will be readily granted, that great learning and extenſive knowledge are a noble fund for invention. An orator therefore ſhould be furniſhed with a ſtock of important truths, ſolid maxims of reaſon, and a variety of knowledge, collected and treaſured up both from obſervation and a large acquaintance with the liberal arts, that he may not only be qualified to expreſs himſelf in the moſt agreeable manner, but likewiſe to ſupport what he ſays with the ſtrongeſt and cleareſt arguments.

But becauſe all are not born with a like happy genius, and have not the ſame opportunity to cultivate their minds with learning and knowledge; and becauſe nothing is more difficult than to dwell long upon the conſideration of one thing, in order to find out the ſtrongeſt arguments which may be offered for and againſt it; upon theſe accounts, art has preſcribed a method to leſſen, in ſome meaſure, theſe difficulties, and help every one to a ſupply of arguments upon any ſubject. And this is done by the contrivance of *common places,* which Cicero calls the *ſeats* or *heads of arguments,* and by a Greek name *topics.* They are of two ſorts, *internal* and *external.*

10
Rules of art to ſupply the place of extenſive learning or acute genius.

I. *Internal topics.* Though things, with regard to their nature and properties, are exceedingly various, yet they have certain common relations, by means whereof the truth of what is either affirmed or denied concerning them in any reſpect may be evinced. The ancient Greek rhetoricians therefore reduced theſe relations to ſome general heads, which are termed *loci* or *common places;* becauſe the reaſons or arguments ſuited to prove any propoſition are repoſited in them, as a common fund or receptacle. And they are called *internal heads,* becauſe they ariſe from the ſubject upon which the orator treats; and are therefore diſtinguiſhed from others named *external,* which he fetches from without, and applies to his preſent purpoſe, as will be ſhown hereafter. Cicero and Quintilian make them 16; three of which comprehend the whole thing they are brought to prove, namely, *definition, enumeration,* and *notation:* of the remaining 13, ſome contain a part of it, and the reſt its various properties and circumſtances, with other conſiderations relating to it; and theſe are, *genus, ſpecies, antecedents, conſequents, adjuncts, conjugates, cauſe, effect, contraries, oppoſites, ſimilitude, diſſimilitude,* and *compariſon.*

Definition explains the nature of the thing defined, and ſhows what it is. And to whatſoever the definition agrees, the thing defined does ſo likewiſe. If therefore Socrates be a rational creature, he is a man; becauſe it is the definition of a man, that he is a rational creature.

Enumeration takes in all the parts of a thing. And from this we prove, that what agrees to all the parts agrees to the whole; and what does not agree to any one or more parts, does not agree to the whole: As when Cicero proves to Piſo that all the Roman ſtate hated him, by enumerating the ſeveral ranks and orders of Roman citizens who all did ſo.

Notation, or etymology, explains the meaning or ſignification of a word. From which we reaſon thus: "If he cannot pay his debts, he is inſolvent;" for that is the meaning of the word *inſolvent.*

Genus is what contains under it two or more ſorts of things, differing in nature. From this head logicians reaſon thus: "Becauſe every animal is mortal, and man is an animal, therefore man is mortal." But orators make a further uſe of this argument, which they call *aſcending from the hypotheſis to the theſis;* that is, from a particular to a general: As ſhould a perſon, when ſpeaking in praiſe of juſtice, take occaſion from thence to commend and ſhow the excellency of virtue in general, with a view to render that particular virtue more amiable. For ſince every ſpecies contains in it the whole nature of the genus to which it relates, beſides what is peculiar to itſelf, whereby it is diſtinguiſhed from it; what is affirmed of the genus, muſt of neceſſity be applicable to the ſpecies.

Species is that which comprehends under it all the individuals of the ſame nature. From hence we may argue, "He is a man, therefore he has a rational ſoul." And orators ſometimes take occaſion from this head to deſcend from the theſis to the hypotheſis;

that is, in treating upon what is more general, to introduce ſome particular contained under it, for the greater illuſtration of the general.

Antecedents are ſuch things, as, being once allowed, others neceſſarily, or very probably, follow. From this head an inſeparable property is proved from its ſubject: as, It is material, and therefore corruptible.

Conſequents are ſuch things as, being allowed, neceſſarily or very probably infer their antecedents. Hence the ſubject is proved from an inſeparable property, in this manner: It is corruptible, and therefore material.

Adjuncts are ſeparable properties of things, or circumſtances that attend them. Theſe are very numerous, and afford a great variety of arguments, ſome of which uſually occur in every diſcourſe. They do not neceſſarily infer their ſubject; but, if fitly choſen, render a thing credible, and are a ſufficient ground for aſſent. The way of reaſoning from them we ſhall ſhow preſently.

Conjugates are words deduced from the ſame origin with that of our ſubject. By theſe the habit is proved from its acts: as, He who does juſtly is juſt. He does not act wiſely, therefore he is not wiſe. But this inference will not hold, unleſs the actions appear continued and conſtant.

A *cauſe* is that, by the force of which a thing does exiſt. There are four kinds of cauſes, matter, form, efficient, and end, which afford a great variety of arguments. The way of reaſoning from them is to infer the effect from the cauſe: as, Man is endued with reaſon, therefore he is capable of knowledge.

An *effect* is that which ariſes from a cauſe, therefore the cauſe is proved by it: as, He is endued with knowledge, therefore with reaſon.

Contraries are things, which, under the ſame genus, are at the utmoſt diſtance from each other; ſo that what we grant to the one, we utterly deny the other: as Virtue ought to be embraced, therefore vice ſhould be avoided.

Oppoſites are ſuch things, which, though repugnant to each other, yet are not directly contradictory; as, To love and to injure, to hate and to commend. They differ from contraries in this, that they do not abſolutely exclude one another. An argument is drawn from things repugnant, thus: He will do a man a miſchief, therefore he does not love him. He loves a man, therefore he will not reproach him.

Similitude is an agreement of things in quality. Thus Cicero proves, that pernicious citizens ought to be taken out of the ſtate; by the likeneſs they bear to corrupted members, which are cut off to prevent further damage to the body.

Diſſimilitude is a diſagreement of things in quality. From this head Cicero ſhows the preference of his own exile to Piſo's government of Macedonia; by the difference between their conduct, and the people's eſteem of them.

Compariſon is made three ways: for either a thing is compared with a greater, with a leſs, or with its equal. This place, therefore, differs from that of ſimilitude on this account, that the quality was conſidered in that, but here the quantity. An argument from the greater is thus drawn: If five legions could not conquer the enemy, much leſs will two.

11
The manner of reaſoning from theſe heads.

We ſhall juſt give one example of the manner of reaſoning from theſe heads, whereby the uſe of them may further appear. If any one, therefore, ſhould have endeavoured to perſuade Cicero not to accept of his life upon the condition offered him by Antony, That he would burn his Philippic orations which had been ſpoken againſt him, he might be ſuppoſed to uſe ſuch arguments as theſe; partly taken from the adjuncts of Cicero, partly from thoſe of Antony, and partly from the thing itſelf. And firſt with regard to Cicero, it might be ſaid, That ſo great a man ought not to purchaſe his life at ſo dear a price as the loſs of that immortal honour which by ſo great pains and labour he had acquired. And this might be confirmed by another argument, That now he was grown old, and could not expect to live much longer. And from the character of Antony he might argue thus: That he was very crafty and deceitful; and only deſigned, by giving him hopes of life, to have the Philippics firſt burnt, which otherwiſe he knew would tranſmit to poſterity an eternal brand of infamy upon him; and then he would take off the author. And this might be ſhown by compariſon. For ſince he would not ſpare others, who had not ſo highly exaſperated him, and from whom he had not ſo much to fear; certainly he would not forgive Cicero, ſince he knew well enough, that ſo long as he lived, he himſelf could never be in ſafety. And, laſtly, An argument might alſo be fetched from the nature of the thing itſelf, in the following manner: That Cicero by this action would ſhamefully betray the ſtate, and the cauſe of liberty, which he had through his whole life moſt courageouſly defended, with ſo great honour to himſelf, and advantage to the public. Upon ſuch an account, a perſon might have uſed theſe or the like arguments with Cicero, which ariſe from the forementioned heads.

12
They are of no ſolid utility unleſs there is a previous foundation of learning and genius.

From this account of common places, it is eaſy to conceive what a large field of diſcourſe they open to the mind upon every ſubject. At the ſame time, though we have mentioned them from our reſpect for the orators of Greece and Rome, we heartily ſubſcribe to the opinion of a celebrated modern, who gives of them the following account.

"The Grecian ſophiſts were the firſt inventors of this artificial ſyſtem of Oratory; and they ſhowed a prodigious ſubtility and fertility in the contrivance of theſe loci. Succeeding rhetoricians, dazzled by the plan, wrought them into ſo regular a ſyſtem, that one would think they meant to teach how a perſon might mechanically become an orator, without any genius at all. They gave him receipts for making ſpeeches on all manner of ſubjects. At the ſame time, it is evident, that though this ſtudy of common places might produce very ſhowy academical declamations, it could never produce uſeful diſcourſes on real buſineſs. The loci indeed ſupplied a moſt exuberant fecundity of matter. One who had no other aim, but to talk copiouſly and plauſibly, by conſulting them on every ſubject, and laying hold of all that they ſuggeſted, might diſcourſe without end; and that, too, though he had none but the moſt ſuperficial knowledge of his ſubject. But ſuch diſcourſe could be no other than trivial. What is truly ſolid and perſuaſive, muſt be drawn *ex viſceribus cauſæ*, from a thorough knowledge of the ſubject, and profound meditation on it. They who

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who would direct ſtudents of oratory to any other ſources of argumentation, only delude them; and by attempting to render rhetoric too perfect an art, they render it, in truth, a trifling and childiſh ſtudy."

13
Of external topics, generally called *teſtimonies.*

II. *Of external topics.* When the orator reaſons from ſuch topics as do not ariſe from his ſubject, but from things of a different nature, theſe are called *external.* They are all taken from authorities, and are by one general name called *Teſtimonies.*

Now a teſtimony may be expreſſed by writing, ſpeech, or any other ſign proper to declare a perſon's mind. And all teſtimonies may be diſtinguiſhed into two ſorts, divine and human. A divine teſtimony, when certainly known to be ſuch, is inconteſtable, and admits of no debate, but ſhould be acquieſced in without heſitation. Indeed the ancient Greeks and Romans eſteemed the pretended oracles of their deities, the anſwers of their augurs, and the like fallacies, divine teſtimonies: but with us no one can be ignorant of their true notion, though they do not ſo directly come under our preſent conſideration. Human teſtimonies, conſidered as furniſhing the orator with arguments, may be reduced to three heads; *writings, witneſſes,* and *contracts.*

14
Reduced to three heads, and ſeparately explained.

1. By *Writings,* here, are to be underſtood written laws, wills, or other legal inſtruments, expreſſed and conveyed in that manner. And it is not ſo much the force and validity of ſuch teſtimonies, conſidered in themſelves, that is here intended, as the occaſion of diſpute which may at any time ariſe concerning their true deſign and import, when produced in proof upon either ſide of a controverſy. And theſe are five; Ambiguity, Diſagreement between the words and intention, Contrariety, Reaſoning, and Interpretation.

A writing is then ſaid to be ambiguous, when it is capable of two or more ſenſes, which makes the writer's deſign uncertain. Now ambiguity may ariſe either from ſingle words, or the conſtruction of ſentences. From ſingle words; as when either the ſenſe of a word, or the application of it, is doubtful. As, ſhould it be queſtioned, whether ready money ought to be included under the appellation of chattels left by a will; or, if a teſtator bequeath a certain legacy to his nephew Thomas, and he has two nephews of that name. But ambiguity is alſo ſometimes occaſioned from the conſtruction of a ſentence; as when ſeveral things or perſons having been already mentioned, it is doubtful to which of them that which follows ought to be referred. For example, a perſon writes thus in his will: 'Let my heir give as a legacy to Titius a horſe out of my ſtable, which he pleaſes.' Here it may be queſtioned, whether the word *he* refers to the heir or to Titius; and conſequently, whether the heir be allowed to give Titius which horſe he pleaſes, or Titius may chooſe which he likes beſt. Now as to controverſies of this kind, in the firſt caſe above mentioned, the party who claims the chattels may plead, that all moveable goods come under that name, and therefore that he has a right to the money. This he will endeavour to prove from ſome inſtances where the word has been ſo uſed. The buſineſs of the oppoſite party is to refute this, by ſhowing that money is not there included. And if either ſide produce precedents in his favour, the other may endeavour to ſhow that the caſes are not parallel. As to the ſecond caſe, ariſing from an ambiguity in the name, if any other words or expreſſions in the will ſeem to countenance either of the claimants, he will not fail to interpret them to his advantage. So likewiſe, if any thing ſaid by the teſtator, in his lifetime, or any regard ſhown to either of theſe nephews more than the other, may help to determine which of them was intended, a proper uſe may be made of it. And the ſame may be ſaid with regard to the third caſe. In which the legatee may reaſon likewiſe from the common uſe of language, and ſhow that in ſuch expreſſions it is uſual to make the reference to the laſt or next antecedent; and from thence plead, that it was the deſign of the teſtator to give him the option. But in anſwer to this, it may be ſaid, that allowing it to be very often ſo, yet in this inſtance it ſeems more eaſy and natural to repeat the verb *give* after *pleaſes,* and ſo to ſupply the ſentence, *which he pleaſes to give him,* referring it to the heir, than to bring in the verb *chooſe,* which was not in the ſentence before; and ſo, by ſupplying the ſenſe, *which he pleaſes to chooſe,* to give the option to Titius. But where controverſies of this kind ariſe from a law, recourſe may be had to other laws where the ſame thing has been expreſſed with greater clearneſs; which may help to determine the ſenſe of the paſſage in diſpute.

A ſecond controverſy from writings is, when one party adheres to the words, and the other to what he aſſerts was the writer's intention. Now he who oppoſes the literal ſenſe, either contends, that what he himſelf offers is the ſimple and plain meaning of the writing, or that it muſt be ſo underſtood in the particular caſe in diſpute. An inſtance of the former is this, as we find it in Cicero. A perſon who died without children, but left a widow, had made this proviſion in his will: "If I have a ſon born to me, he ſhall be my heir." And a little after: "If my ſon die before he comes of age, let Curius be my heir." There is no ſon born: Curius therefore ſues for the eſtate, and pleads the intention of the teſtator, who deſigned him for his heir, if he ſhould have no ſon who arrived at age; and ſays, there can be no reaſon to ſuppoſe he did not intend the ſame perſon for his heir if he had no ſon, as if he ſhould have one who afterwards died in his minority. But the heir at law inſiſts upon the words of the will; which, as he ſays, require, that firſt a ſon ſhould be born, and afterwards die under age, before Curius can ſucceed to the inheritance; and there being no ſon, a ſubſtituted heir, as Curius was, can have no claim where the firſt heir does not exiſt, from whom he derives his pretenſion, and was to ſucceed by the appointment of the will.—Of the latter caſe, rhetoricians give this example: "It was forbidden by a law to open the city gates in the night. A certain perſon notwithſtanding, in time of war, did open them in the night, and let in ſome auxiliary troops, to prevent their being cut off by the enemy, who was poſted near the town." Afterwards, when the war was over, this perſon is arraigned, and tried for his life on account of this action. Now, in ſuch a caſe, the proſecutor founds his charge upon the expreſs words of the law; and pleads, that no ſufficient reaſon can be aſſigned for going contrary to the letter of it, which would be to make a new law, and not to execute one already made. The defendant, on the other hand, alleges, That the fact he is charged with cannot, however, come within the intention of the law; ſince he either could not, or ought not, to have complied with the letter of it in that particular caſe, which muſt therefore neceſſarily be ſuppoſed to have been excepted in the deſign of that law when it was made. But to this the proſecutor may reply, That all ſuch exceptions as are intended by any law, are uſually expreſſed in it: and inſtances may be brought of particular exceptions expreſſed in ſome laws; and if there be any ſuch exception in the law under debate, it ſhould eſpecially be mentioned. He may further add, That to admit of exceptions not expreſſed in the law itſelf, is to enervate the force of all laws, by explaining them away, and in effect to render them uſeleſs. And this he may further corroborate, by comparing the law under debate with others, and conſidering its nature and importance, and how far the public intereſt of the ſtate is concerned in the due and regular execution of it; from whence he may infer, that ſhould exceptions be admitted in other laws of leſs conſequence, yet, however, they ought not in this. Laſtly, He may conſider the reaſon alleged by the defendant, on which he founds his plea, and ſhow there was not that neceſſity of violating the law in the preſent caſe, as is pretended. And this is often the more requiſite, becauſe the party who diſputes againſt the words of the law, always endeavours to ſupport his allegations from the equity of the caſe. If, therefore, this plea can be enervated, the main ſupport of the defendant's cauſe is removed. For as the former arguments are deſigned to prevail with the judge, to determine the matter on this ſide the queſtion from the nature of the caſe; ſo the intention of this argument is to induce him to it, from the weakneſs of the defence made by the oppoſite party. But the defendant will, on the contrary, uſe ſuch arguments as may beſt demonſtrate the equity of his cauſe, and endeavour to vindicate the fact from his good deſign and intention in doing it. He will ſay, That the laws have allotted puniſhments for the commiſſion of ſuch facts as are evil in themſelves, or prejudicial to others; neither of which can be charged upon the action for which he is accuſed: That no law can be rightly executed, if more regard be had to the words and ſyllables of the writing, than to the intention of the legiſlator. To which purpoſe, he may allege that direction of the law itſelf, which ſays, "The law ought not to be too rigorouſly interpreted, nor the words of it ſtrained; but the true intention and deſign of each part of it duly conſidered." As alſo that ſaying of Cicero, "What law may not be weakened and deſtroyed, if we bend the ſenſe to the words, and do not regard the deſign and view of the legiſlator?" Hence he may take occaſion to complain of the hardſhip of ſuch a procedure, that no difference ſhould be made between an audacious and wilful crime, and an honeſt or neceſſary action, which might happen to diſagree with the letter of the law, though not with the intent of it. And as it was obſerved before to be of conſiderable ſervice to the accuſer, if he could remove the defendant's plea of equity; ſo it will be of equal advantage to the defendant, if he can fix upon any words in the law, which may in the leaſt ſeem to countenance his caſe, ſince this will take off the main force of the charge.

The third controverſy of this kind is, when two writings happen to claſh with each other, or at leaſt ſeem to do ſo. Of this Hermogenes gives the following inſtance. One law enjoins: "He who continues alone in a ſhip during a tempeſt, ſhall have the property of the ſhip." Another law ſays, "A diſinherited ſon ſhall enjoy no part of his father's eſtate." Now a ſon, who had been diſinherited by his father, happens to be in his father's ſhip in a tempeſt, and continues there alone, when every one elſe had deſerted it. He claims the ſhip by the former of theſe laws, and his brother tries his right with him by the latter. In ſuch caſes, therefore, it may firſt be conſidered, "Whether the two laws can be reconciled. And if that cannot be done, then, Which of them appears more equitable. Alſo, Whether one be poſitive, and the other negative; becauſe prohibitions are a ſort of exceptions to poſitive injunctions. Or, If one be a general law, and the other more particular, and come nearer to the matter in queſtion. Likewiſe, Which was laſt made: ſince former laws are often abrogated, either wholly or in part, by ſubſequent laws; or at leaſt were deſigned to be ſo. Laſtly, It may be obſerved, Whether one of the laws be not plain and expreſs; and the other more dubious, or has any ambiguity in it. All, or any of which things, that party will not omit to improve for his advantage whoſe intereſt is concerned in it.

The fourth controverſy is *reaſoning*. As when ſomething, not expreſsly provided for by a law, is inferred by a ſimilitude, or parity of reaſon, from what is contained in it. Quintilian mentions this inſtance of it. "There was a law made at Tarentum, to prohibit the exportation of wool; but a certain perſon exports ſheep." In this caſe, the proſecutor may firſt compare the thing which occaſions the charge, with the words of the law, and ſhow their agreement, and how unneceſſary it was that particular thing ſhould have been expreſsly mentioned in the law, ſince it is plainly contained in it, or at leaſt an evident conſequence from it. He may then plead, that many things of a like nature are omitted in other laws for the ſame reaſon. And, laſtly, He may urge the reaſonableneſs and equity of the procedure. The defendant, on the other hand, will endeavour to ſhow the deficiency of the reaſoning, and the difference between the two caſes. He will inſiſt upon the plain and expreſs words of the law, and ſet forth the ill tendency of ſuch inferences and concluſions drawn from ſimilitudes and compariſons, ſince there is ſcarce any thing but in ſome reſpect may bear a reſemblance to another.

The laſt controverſy under this head is *interpretation*, in which the diſpute turns upon the true meaning and explication of the law in reference to that particular caſe. We have the following inſtance of this in the Pandects: "A man who had two ſons both under age, ſubſtitutes Titius as heir to him who ſhould die laſt, provided both of them died in their minority. They both periſh together at ſea before they came to age. Here ariſes a doubt, whether the ſubſtitution can take place, or whether the inheritance devolves to the heir at law." The latter pleads, That as neither of them can be ſaid to have died laſt, the ſubſtitution cannot take place; which was ſuſpended, upon the condition that one died after the other. But to this it may be ſaid, It was the intention of the teſtator, that if both died in their nonage, Titius ſhould ſucceed to the inheritance; and therefore it makes no difference whether they died together, or one after the other: and ſo the law determines it.

2. The *ſecond* head of external arguments are *Witneſſes*. Theſe may either give their evidence, when abſent in writing ſubſcribed with their name; or preſent by word of mouth. And what both of them teſtify, may either be from hearſay; or what they ſaw themſelves, and were preſent at the time it was done. As the weight of the evidence may be thought greater or leſs on each of theſe accounts, either party will make ſuch uſe of it as he finds for his advantage. The characters of the witneſſes are alſo to be conſidered; and if any thing be found in their lives or behaviour that is juſtly exceptionable, to invalidate their evidence, it ought not to be omitted. And how they are affected to the contending parties, or either of them, may deſerve conſideration; for ſome allowances may be judged reaſonable in caſe of friendſhip, or enmity, where there is no room for any other exception. But regard ſhould chiefly be had to what they teſtify, and how far the cauſe is affected by it. Cicero is very large upon moſt of theſe heads in his defence of Marcus Fonteius, with a deſign to weaken the evidence of the Gauls againſt him. And where witneſſes are produced on one ſide only, as orators ſometimes attempt to leſſen the credit of this kind of proof, by pleading that witneſſes are liable to be corrupted, or biaſſed by ſome prevailing intereſt or paſſion, to which arguments taken from the nature and circumſtances of things are not ſubject; it may be anſwered on the other hand, that ſophiſtical arguments and falſe colourings are not expoſed to infamy or puniſhment, whereas witneſſes are reſtrained by ſhame and penalties, nor would the law require them if they were not neceſſary.

3. The *third* and laſt head of external arguments are *Contracts*; which may be either public or private. By public are meant the tranſactions between different ſtates, as leagues, alliances, and the like; which depend on the laws of nations, and come more properly under deliberative diſcourſes, to which we ſhall refer them. Thoſe are called *private*, which relate to leſſer bodies or ſocieties of men, and ſingle perſons; and may be either written or verbal. And it is not ſo much the true meaning and purport of them that is here conſidered as their force and obligation. And, as the Roman law declares, "Nothing can be more agreeable to human faith, than that perſons ſhould ſtand to their agreements." Therefore in controverſies of this kind, the party whoſe intereſt it is that the contract ſhould be maintained, will plead, that ſuch covenants have the force of private laws, and ought religiouſly to be obſerved, ſince the common affairs of mankind are tranſacted in that manner; and therefore to violate them, is to deſtroy all commerce and ſociety among men. On the other ſide it may be ſaid, that juſtice and equity are chiefly to be regarded, which are immutable; and beſides, that the public laws are the common rule to determine all differences, which are deſigned to redreſs thoſe who are aggrieved. And indeed, where a compact has been obtained by force or fraud, it is in itſelf void, and has no effect either in law or reaſon. But on the other hand, the Roman lawyers ſeem to have very rightly determined, that all ſuch obligations as are founded on natural equity, though not binding by national laws, and are therefore called *nuda pacta*, ought, however, in honour and conſcience to be performed.

15
Of the ſtate of a controverſy, or the manner of referring the principal queſtion in diſpute to ſome particular head for greater eaſe of argument.

III. *Of the State of a Controverſy*. The ancients, obſerving that the principal queſtion or point of diſpute in all controverſies might be referred to ſome particular head, reduced theſe heads to a certain number, that both the nature of the queſtion might by that means be better known, and the arguments ſuited to it be diſcovered with greater eaſe. And theſe heads they call *ſtates*.

By the ſtate of a controverſy, then, we are to underſtand the principal point in diſpute between contending parties, upon the proof of which the whole cauſe or controverſy depends. We find it expreſſed by ſeveral other names in ancient writers: as, the *conſtitution of the cauſe*, the *general head*, and the *chief queſtion*. And as this is the principal thing to be attended to in every ſuch diſcourſe; ſo it is what firſt requires the conſideration of the ſpeaker, and ſhould be well fixed and digeſted in his mind, before he proceeds to look for arguments proper to ſupport it. Thus Antony, the Roman orator, ſpeaking of his own method in his pleading, ſays: "When I underſtand the nature of the cauſe, and begin to conſider it, the firſt thing I endeavour to do is, to ſettle with myſelf what that is to which all my diſcourſe relating to the matter in diſpute ought to be referred: then I diligently attend to theſe other two things, How to recommend myſelf, or thoſe for whom I plead, to the good eſteem of my hearers; and how to influence their minds, as may beſt ſuit my deſign." This way of proceeding appears very agreeable to reaſon and prudence. For what can be more abſurd, than for a perſon to attempt the proof of any thing, before he has well ſettled in his own mind a clear and diſtinct notion what the thing is which he would endeavour to prove? Quintilian deſcribes it to be, 'That kind of queſtion which ariſes from the firſt conflict of cauſes.' In judicial caſes, it immediately follows upon the charge of the plaintiff, and plea of the defendant. Our common law expreſſes it by one word, namely the *iſſue*. Which interpreters explain, by deſcribing it to be, "That point of matter depending in ſuit, whereupon the parties join, and put their cauſe to the trial." Examples will further help to illuſtrate this, and render it more evident. In the cauſe of Milo, the charge of the Clodian party is, *Milo killed Clodius*. Milo's plea or defence, *I killed him, but juſtly*. From hence ariſes this grand queſtion, or ſtate of the cauſe, *Whether it was lawful for Milo to kill Clodius?* And that Clodius was lawfully killed by Milo, is what Cicero in his defence of Milo principally endeavours to prove. This is the main ſubject of that fine and beautiful oration. The whole of his diſcourſe is to be conſidered as centering at laſt in this one point. Whatever different matters are occaſionally mentioned, will, if cloſely attended to, be found to have been introduced ſome way or other the better to ſupport and carry on this deſign. Now in ſuch caſes, where the fact is not denied, but ſomething is offered in its defence, the ſtate of the cauſe is taken from the defendant's plea, who is obliged to make it good: As in the inſtance here given, the chief point in diſpute was the lawfulneſs of Milo's action, which it was Cicero's buſineſs to demonſtrate.

But when the defendant denies the fact, the ſtate of the cauſe ariſes from the accuſation; the proof of which then lies upon the plaintiff, and not, as in the former caſe, upon the defendant. So in the cauſe of Roſcius, the charge made againſt him is, *That he killed his father.* But he denies the fact. The grand queſtion therefore to be argued is, *Whether or not he killed his father?* The proof of this lay upon his accuſers. And Cicero's deſign in his defence of him is to ſhow, that they had not made good their charge. But it ſometimes happens, that the defendant neither abſolutely denies the fact, nor attempts to juſtify it; but only endeavours to qualify it, by denying that it is a crime of that nature, or deſerves that name, by which it is expreſſed in the charge. We have an example of this propoſed by Cicero: "A perſon is accuſed of ſacrilege, for taking a thing, that was ſacred, out of a private houſe. He owns the fact, but denies it to be ſacrilege; ſince it was committed in a private houſe, and not in a temple." Hence this queſtion ariſes, *Whether to take a ſacred thing out of a private houſe, is to be deemed ſacrilege, or only ſimple theft?* It lies upon the accuſer to prove what the other denies; and therefore the ſtate of the cauſe is here alſo, as well as in the preceding caſe, taken from the indictment.

But beſides the principal queſtion, there are other ſubordinate queſtions, which follow upon it in the courſe of a diſpute, and ſhould be carefully diſtinguiſhed from it. Particularly that which ariſes from the reaſon, or argument, which is brought in proof of the principal queſtion. For the principal queſtion itſelf proves nothing, but is the thing to be proved, and becomes at laſt the concluſion of the diſcourſe. Thus, in the cauſe of Milo, his argument is, *I killed Clodius juſtly, becauſe he aſſaſſinated me.* Unleſs the Clodian party be ſuppoſed to deny this, they give up their cauſe. From hence therefore this ſubordinate queſtion follows, *Whether Clodius aſſaſſinated Milo?* Now Cicero ſpends much time in the proof of this, as the hinge on which the firſt queſtion, and conſequently the whole cauſe, depended. For if this was once made to appear, the lawfulneſs of Milo's killing Clodius, which was the grand queſtion or thing to be proved, might be inferred as an allowed conſequence from it. This will be evident, by throwing Milo's argument, as uſed by Cicero, into the form of a ſyllogiſm.

An aſſaſſin is lawfully killed:
Clodius was an aſſaſſin:
Therefore he was lawfully killed by Milo whom he aſſaſſinated.

If the minor propoſition of this ſyllogiſm was granted, no one would deny the concluſion: for the Roman law allowed of ſelf-defence. But as Cicero was very ſenſible this would not be admitted, ſo he takes much pains to bring the court into the belief of it. Now where the argument brought in defence of the ſecond queſtion is conteſted, or the orator ſuppoſes that it may be ſo, and therefore ſupports that with another argument, this occaſions a third queſtion conſequent upon the former; and in like manner he may proceed to a fourth. But be they more or fewer, they are to be conſidered but as one chain of ſubordinate queſtions dependent upon the firſt. And though each of them has its particular ſtate, yet none of theſe is what rhetoricians call *The ſtate of the Cauſe*, which is to be underſtood only of the principal queſtion. And if, as it frequently happens, the firſt or principal queſtion is itſelf directly proved from more than one argument: this makes no other difference, but that each of theſe arguments, ſo far as they are followed by others to ſupport them, become a diſtinct ſeries of ſubordinate queſtions, all dependent upon the firſt. As when Cicero endeavours to prove, that Roſcius did not kill his father, from two reaſons or arguments: *Becauſe he had neither any cauſe to move him to ſuch a barbarous action, nor any opportunity for it.*

Moreover, beſides theſe ſubordinate queſtions, there are alſo incidental ones often introduced, which have ſome reference to the principal queſtion, and contribute towards the proof of it, though they are not neceſſarily connected with it, or dependent upon it. And each of theſe alſo has its ſtate, though different from that of the cauſe. For every queſtion, or point of controverſy, muſt be ſtated, before it can be made the ſubject of diſputation. And it is for this reaſon, that every new argument advanced by an orator is called a *queſtion*; becauſe it is conſidered as a freſh matter of controverſy. In Cicero's defence of Milo, we meet with ſeveral of this ſort of queſtions, occaſioned by ſome aſperſions which had been thrown out by the Clodian party to the prejudice of Milo. As, "That he was unworthy to ſee the light, who owned he had killed a man:" For Milo before his trial had openly confeſſed he killed Clodius. So likewiſe, "That the ſenate had declared the killing of Clodius was an illegal action." And further, "That Pompey, by making a new law to ſettle the manner of Milo's trial, had given his judgment againſt Milo." Now to each of theſe Cicero replies, before he proceeds to the principal queſtion. And therefore, though the queſtion, in which the ſtate of a controverſy conſiſts, is ſaid by Quintilian to ariſe from "the firſt conflict of cauſes," yet we find by this inſtance of Cicero, that it is not always the firſt queſtion in order, upon which the orator treats.

But it ſometimes happens, that the ſame cauſe or controverſy contains in it more than one ſtate. Thus in judicial cauſes, every diſtinct charge occaſions a new ſtate. All Cicero's orations againſt Verres relate to one cauſe, founded upon a law of the Romans againſt unjuſt exactions made by their governors of provinces upon the inhabitants; but as that proſecution is made up of as many charges as there are orations, every charge, or indictment, has its different ſtate. So likewiſe his oration in defence of Cœlius has two ſtates, in anſwer to a double charge made againſt him by his adverſaries: one, "for borrowing money of Clodia, in order to bribe certain ſlaves to kill a foreign ambaſſador;" and the other, "for an attempt afterwards to poiſon Clodia herſelf." Beſides which, there were ſeveral other matters of a leſs heinous nature, which had been thrown upon him by his accuſers, with a deſign, very likely, to render the two principal charges more credible; to which Cicero firſt replies, in the ſame manner as in his defence of Milo.

Though all the examples we have hitherto brought to illuſtrate this ſubject have been taken from judicial

cafes,

caſes, yet not only theſe, but very frequently diſcourſes of the deliberative kind, and ſometimes thoſe of the demonſtrative, are managed in a controverſial way. And all controverſies have their ſtate. And therefore Quintilian very juſtly obſerves, that "ſtates belong both to general and particular queſtions; and to all ſorts of cauſes, demonſtrative, deliberative, and judicial." In Cicero's oration for the Manilian law, this is the main point in diſpute between him and thoſe who oppoſed that law: "Whether Pompey was the fitteſt perſon to be intruſted with the management of the war againſt Mithridates?" This is a ſubject of the deliberative kind. And of the ſame nature was that debate in the ſenate concerning the demolition of Carthage. For the matter in diſpute between Cato, who argued for it, and thoſe who were of the contrary opinion, ſeems to have been this: "Whether it was for the intereſt of the Romans to demoliſh Carthage?" And ſo likewiſe in thoſe two fine orations of Cato and Cæſar, given us by Salluſt, relating to the conſpirators with Catiline, who were then in cuſtody, the controverſy turns upon this: "Whether thoſe priſoners ſhould be puniſhed with death, or perpetual impriſonment?" Examples of the demonſtrative kind are not ſo common; but Cicero's oration concerning the 'Anſwers of the ſoothſayers,' may afford us an inſtance of it. Several prodigies had lately happened at Rome; upon which the ſoothſayers being conſulted, aſſigned this as the reaſon of them, Becauſe ſome places conſecrated to the gods had been afterwards converted to civil uſes. Clodius charged this upon Cicero; whoſe houſe was rebuilt at the public expence, after it had been demoliſhed by Clodius, and the ground conſecrated to the goddeſs Liberty. Cicero in this oration retorts the charge; and ſhows that the prodigies did not reſpect him, but Clodius. So that the queſtion in diſpute was, "To which of the two thoſe prodigies related?" This oration does not appear to have been ſpoken in a judicial way, and muſt therefore belong to the demonſtrative kind. His invective againſt Piſo is likewiſe much of the ſame nature, wherein he compares his own behaviour and conduct with that of Piſo.

As to the number of theſe ſtates, both Cicero and Quintilian reduce them to three. "We muſt (ſays Quintilian) agree with thoſe whoſe authority Cicero follows, who tells us, that three things may be inquired into in all diſputes: Whether a thing is; what it is; and how it is. And this is the method which nature preſcribes. For, in the firſt place, it is neceſſary the thing ſhould exiſt about which the diſpute is: becauſe no judgment can be made either of its nature or quality till its exiſtence be manifeſt; which is therefore the firſt queſtion. But though it be manifeſt that a thing is, it does not preſently appear what it is; and when this is known, the quality yet remains: and after theſe three are ſettled, no further inquiry is neceſſary." Now the firſt of theſe three ſtates is called the *conjectural ſtate*; as if it be inquired, "Whether one perſon killed another?" This always follows upon the denial of a fact, by one of the parties; as was the caſe of Roſcius. And it receives its name from hence, that the judge is left, as it were, to conjecture, whether the fact was really committed or not, from the evidence produced on the other ſide. The ſecond is called the *definitive ſtate*, when the fact is not denied; but the diſpute turns upon the nature of it, and what name it is proper to give it: as in that example of Cicero, "Whether to take a ſacred thing out of a private houſe be theft or ſacrilege?" For in this caſe it is neceſſary to ſettle the diſtinct notion of thoſe two crimes, and ſhow their difference. The third is called the *ſtate of quality*; when the contending parties are agreed both as to the fact, and the nature of it; but the diſpute is, "Whether it be juſt or unjuſt, profitable or unprofitable, and the like;" as in the cauſe of Milo.

From what has been ſaid upon this ſubject, the uſe of it may in a good meaſure appear. For whoever engages in a controverſy, ought in the firſt place to conſider with himſelf the main queſtion in diſpute, to fix it well in his mind, and keep it conſtantly in his view; without which he will be very liable to ramble from the point, and bewilder both himſelf and his hearers. And it is no leſs the buſineſs of the hearers principally to attend to this; by which means they will be helped to diſtinguiſh and ſeparate from the principal queſtion what is only incidental, and to obſerve how far the principal queſtion is affected by it; to perceive what is offered in proof, and what is only brought in for illuſtration; not to be miſled by digreſſions, but to diſcern when the ſpeaker goes off from his ſubject, and when he returns to it again; and, in a word, to accompany him through the whole diſcourſe, and carry with them the principal chain of reaſoning upon which the cauſe depends, ſo as to judge upon the whole, whether he has made out his point, and the concluſion follows from the premiſes.

CHAP. II. *Of Arguments ſuited to Demonſtrative Diſcourſes.*

16 Of arguments ſuited to demonſtrative diſcourſes.

THESE conſiſt either in praiſe or diſpraiſe; and, agreeably to the nature of all contraries, one of them will ſerve to illuſtrate the other.

Now we either praiſe *perſons* or *things*.

I. In praiſing or diſpraiſing *perſons*, rhetoricians preſcribe two methods. One is, to follow the order in which every thing happened that is mentioned in the diſcourſe; the other is, to reduce what is ſaid under certain general heads, without a ſtrict regard to the order of time.

1. In purſuing the former method, the diſcourſe may be very conveniently divided into three periods. The firſt of which will contain what preceded the perſon's birth; the ſecond, the whole courſe of his life; and the third what followed upon his death.

Under the firſt of theſe may be comprehended what is proper to be ſaid concerning his country or family. And therefore, if theſe were honourable, it may be ſaid to his advantage, that he nowiſe diſgraced them, but acted ſuitably to ſuch a deſcent. But if they were not ſo, they may be either wholly omitted; or it may be ſaid, that, inſtead of deriving thence any advantage to his character, he has conferred a laſting honour upon them; and that it is not of ſo much moment where, or from whom, a perſon derives his birth, as how he lives.

In the ſecond period, which is that of his life, the qualities both of his mind and body, with his circumſtances in the world, may be ſeparately conſidered.

Though, as Quintilian rightly obſerves, "All external advantages are not praiſes for themſelves, but according to the uſe that is made of them. For riches, and power, and intereſt, as they have great influence, and may be applied either to good or bad purpoſes, are a proof of the temper of our minds; and therefore we are either made better or worſe by them." But theſe things are a juſt ground for commendation, when they are the reward of virtue or induſtry. Bodily endowments are health, ſtrength, beauty, activity, and the like; which are more or leſs commendable, according as they are employed. And where theſe, or any of them, are wanting, it may be ſhown, that they are abundantly compenſated by the more valuable endowments of the mind. Nay, ſometimes a defect in theſe may give an advantageous turn to a perſon's character; for any virtue appears greater, in proportion to the diſadvantages the perſon laboured under in exerting it. But the chief topics of praiſe are taken from the virtues and qualifications of the mind. And here the orator may conſider the diſpoſition, education, learning, and ſeveral virtues, which ſhone through the whole courſe of the perſon's life. In doing which, the preference ſhould always be given to virtue above knowledge or any other accompliſhment. And in actions, thoſe are moſt conſiderable, and will be heard with greateſt approbation, which a perſon either did alone, or firſt, or wherein he had feweſt aſſociates; as likewiſe thoſe which exceeded expectation, or were done for the advantage of others rather than his own. And further, as the laſt ſcene of a man's life generally commands the greateſt regard, if any thing remarkable at that time was either ſaid or done, it ought particularly to be mentioned. Nor ſhould the manner of his death, or cauſe of it, if accompanied with any commendable circumſtances be omitted; as if he died in the ſervice of his country, or in the purſuit of any other laudable deſign.

The third and laſt period relates to what followed after the death of the perſon. And here the public loſs, and public honours conferred upon the deceaſed, are proper to be mentioned. Sepulchres, ſtatues, and other monuments to perpetuate the memory of the dead, at the expence of the public, were in common uſe both among the Greeks and Romans. But in the earlieſt times, as theſe honours were more rare, ſo they were leſs coſtly. For as in one age it was thought a ſufficient reward for him who died in the defence of his country, to have his name cut in a marble inſcription, with the cauſe of his death; ſo in others it was very common to ſee the ſtatues of gladiators, and perſons of the meaneſt rank, erected in public places. And therefore a judgment is to be formed of theſe things from the time, cuſtom, and circumſtances, of different nations; ſince the frequency of them renders them leſs honourable, and takes off from their evidence as the rewards of virtue. But, as Quintilian ſays, "Children are an honour to their parents, cities to their founders, laws to thoſe who compiled them, arts to their inventors, and uſeful cuſtoms to the authors of them."

And this may ſuffice for the method of praiſing perſons, when we propoſe to follow the order of time, as Iſocrates has done in his funeral oration upon Evagoras king of Salamis, and Pliny in his panegyric upon the emperor Trajan. But as this method is very plain and obvious, ſo it requires the more agreeable dreſs to render it delightful; leſt otherwiſe it ſeem rather like a hiſtory than an oration: For which reaſon, we find, that epic poets, as Homer, Virgil, and others, begin with the middle of their ſtory, and afterwards take a proper occaſion to introduce what preceded, to diverſify the ſubject, and give the greater pleaſure and entertainment to their readers.

2. The other method above hinted was, to reduce the diſcourſe to certain general heads without regarding the order of time. As if any one, in praiſing the elder Cato, ſhould propoſe to do it, by ſhowing that he was a moſt prudent ſenator, an excellent orator, and moſt valiant general; all which commendations are given him by Pliny. In like manner, the character of a good general may be compriſed under four heads; ſkill in military affairs, courage, authority, and ſucceſs: from all which Cicero commends Pompey. And agreeably to this method Suetonius has written the lives of the firſt twelve Cæſars.

But in the praiſing of perſons, care ſhould always be taken to ſay nothing that may ſeem fictitious or out of character, which may call the orator's judgment or integrity in queſtion. It was not without cauſe, therefore, that Lyſippus the ſtatuary, as Plutarch tells us, blamed Apelles for painting Alexander the Great with thunder in his hand; which could never ſuit his character as a man, however he might boaſt of his divine deſcent: for which reaſon Lyſippus himſelf made an image of him holding a ſpear, as the ſign of a warrior. Light and trivial things in commendations are likewiſe to be avoided, and nothing mentioned but what may carry in it the idea of ſomething truly valuable, and which the hearers may be ſuppoſed to wiſh for, and is proper to excite their emulation. Theſe are the principal heads of praiſe with relation to men. In diſpraiſe, the heads contrary to theſe are requiſite; which being ſufficiently clear from what has been ſaid, need not particularly be inſiſted on.

II. We proceed therefore to the other part of the diviſion, which reſpects *things*, as diſtinguiſhed from perſons. By which we are to underſtand all beings inferior to man, whether animate or inanimate; as likewiſe the habits and diſpoſitions of men, either good or bad, when conſidered ſeparately, and apart from their ſubjects, as arts and ſciences, virtues and vices, with whatever elſe may be a proper ſubject for praiſe or diſpraiſe. Some writers, indeed, have, for their own amuſement and the diverſion of others, diſplayed their eloquence in a jocoſe manner upon ſubjects of this kind. So Lucian has written in praiſe of a fly, and Syneſius an elegant encomium upon baldneſs. Others, on the contrary, have done the like in a ſatirical way. Such is Seneca's apotheoſis or conſecration of the emperor Claudius; and the Myſopogon or beard-hater, written by Julian the emperor. Not to mention ſeveral modern authors, who have imitated them in ſuch ludicrous compoſitions. But as to theſe things, and all of the like nature, the obſervation of Antony in Cicero ſeems very juſt: "That it is not neceſſary to reduce every ſubject we diſcourſe upon to rules of art." For many are ſo trivial, as not to deſerve it; and others ſo plain and evident of themſelves, as not to require it. But ſince it frequently comes in the way both of orators and hiſtorians to deſcribe countries, cities, and facts, we ſhall briefly mention the principal heads of invention proper to illuſtrate each of theſe.

Countries, then, may be celebrated from the pleaſantneſs of their ſituation, the clemency and wholeſomeneſs of the air, and goodneſs of the ſoil; to which laſt may be referred the ſprings, rivers, woods, plains, mountains, and minerals. And to all theſe may be added their extent, cities, the number and antiquity of the inhabitants; their policy, laws, cuſtoms, wealth, character for cultivating the arts both of peace and war; their princes, and other eminent men they have produced. Thus Pacatus has given us a very elegant deſcription of Spain, in his panegyric upon the emperor Theodoſius, who was born there.

Cities are praiſed from much the ſame topics as countries. And here, whatever contributes either to their defence or ornament ought particularly to be mentioned; as the ſtrength of the walls and fortifications, the beauty and ſplendour of the buildings, whether ſacred or civil, public or private. We have in Herodotus a very fine deſcription of Babylon, which was once the ſtrongeſt, largeſt, and moſt regular city in the world. And Cicero has accurately deſcribed the city of Syracuſe, in the iſland Sicily, in one of his orations againſt Verres.

But facts come much oftener under the cognizance of an orator. And theſe receive their commendation from their honour, juſtice, or advantage. But in deſcribing them, all the circumſtances ſhould be related in their proper order; and that in the moſt lively and affecting manner, ſuited to their different nature. Livy has repreſented the demolition of Alba by the Roman army, which was ſent thither to deſtroy it, through the whole courſe of that melancholy ſcene, in a ſtyle ſo moving and pathetic, that one can hardly forbear condoling with the inhabitants, upon reading his account.

But in diſcouſes of this kind, whether of praiſe or diſpraiſe, the orator ſhould (as he ought indeed upon all occaſions) well conſider where, and to whom, he ſpeaks. For wiſe men often think very differently both of perſons and things from the common people. And we find that learned and judicious men are frequently divided in their ſentiments, from the ſeveral ways of thinking to which they have been accuſtomed. Beſides, different opinions prevail, and gain the aſcendant, at different times. While the Romans continued a free nation, love of their country, liberty, and public ſpirit, were principles in the higheſt eſteem among them. And therefore, when Cato killed himſelf, that he might not fall into the hands of Cæſar, and ſurvive the liberty of his country, it was thought an inſtance of the greateſt heroic virtue; but afterwards, when they had been accuſtomed to an arbitrary government, and the ſpirit of liberty was now loſt, the poet Martial could venture to ſay,

Death to avoid 'tis madneſs ſure to die.

A prudent orator therefore will be cautious of oppoſing any ſettled and prevailing notions of thoſe to whom he addreſſes, unleſs it be neceſſary; and then he will do it in the ſofteſt and moſt gentle manner.

Chap. III. *Of Arguments ſuited to Deliberative Diſcourſes.*

17 Of deliberative diſcourſes, and the arguments ſuited to them.

This kind of diſcourſes muſt certainly have been very ancient; ſince, doubtleſs, from the firſt beginning of men's converſing together, they deliberated upon their common intereſt, and offered their advice to each other. But neither thoſe of the laudatory nor judicial kind could have been introduced, till mankind were ſettled in communities, and found it neceſſary to encourage virtue by public rewards, and bring vice under the reſtraint of laws. The early practice of ſuaſory diſcourſes appears from ſacred writ, where we find, that when Moſes was ordered upon an embaſſy into Egypt, he would have excuſed himſelf for want of eloquence. And Homer repreſents the Greeks at the ſiege of Troy, as flocking like a ſwarm of bees to hear their generals harangue them. Nor is this part of oratory leſs conſpicuous for its uſefulneſs to mankind, than for its antiquity; being highly beneficial either in councils, camps, or any ſocieties of men. How many inſtances have we upon record, where the fury of an enraged multitude has been checked and appeaſed by the prudent and artful perſuaſion of ſome particular perſon? The ſtory of Agrippa Menenius, when the commons of Rome withdrew from the ſenators, and retired out of the city, is too well known to need reciting. And how often have armies been animated and fired to the moſt dangerous exploits, or recalled to their duty, when ready to mutiny, by a moving ſpeech of their general? many inſtances of which we find in hiſtory.

All deliberation reſpects ſomething future, for it is in vain to conſult about what is already paſt. The ſubject matter of it is, either things public or private, ſacred or civil; indeed all the valuable concerns of mankind, both preſent and future, come under its regard. And the end propoſed by this kind of diſcourſes is chiefly profit or intereſt. But ſince nothing is truly profitable, but what is in ſome reſpect good; and every thing which is good in itſelf may not in all circumſtances be for our advantage; properly ſpeaking, what is both good and profitable, or beneficial good, is the end here deſigned. And therefore, as it ſometimes happens, that what appears profitable may ſeem to interfere with that which is ſtrictly juſt and honourable; in ſuch caſes it is certainly moſt adviſeable to determine on the ſafer ſide of honour and juſtice, notwithſtanding ſome plauſible things may be offered to the contrary. But where the diſpute lies apparently between what is truly honeſt, and ſome external advantage propoſed in oppoſition to it, all good men cannot but agree in favour of honeſty. Such was the caſe of Regulus, who, being taken priſoner by the Carthaginians, was permitted to go to Rome upon giving his oath, that unleſs he could perſuade the ſenate to ſet at liberty ſome young Carthaginian noblemen, then priſoners at Rome, in exchange for him, he ſhould return again to Carthage. But Regulus, when he came to Rome, was ſo far from endeavouring to prevail with the ſenate to comply with the deſire of the Carthaginians, that he uſed all his intereſt to diſſuade them from hearkening to the propoſal. Nor could the moſt earneſt entreaties of his neareſt relations and friends, nor any arguments they were able to offer, engage him to continue at Rome, and not return again to Carthage. He had then plainly in his view, on the ſide, caſe, ſecurity, aſſluence, honours, and the enjoyment of his friends; and on the other, certain death, attended with cruel torments. However, thinking the former not conſiſtent with truth and juſtice, he choſe the latter. And he certainly acted as became an honeſt and brave man, in chooſing death, rather than to violate his oath. Though whether he did prudently in perſuading the ſenate not to make the exchange, or they in complying with him, we ſhall leave others to determine. Now, when it proves to be a matter of debate, whether a thing upon the whole be really beneficial or not; as here ariſe two parts, advice and diſſuaſion, they will each require proper heads of argument. But as they are contrary to each other, he who is acquainted with one, cannot well be ignorant of the other. We ſhall therefore chiefly mention thoſe proper for advice, from whence ſuch as are ſuited to diſſuade will eaſily be perceived. Now the principal heads of this kind are theſe following, which are taken from the nature and properties of the thing itſelf under conſideration.

1. *Pleaſure* often affords a very cogent argument in diſcourſes of this nature. Every one knows what an influence this has upon the generality of mankind. Though, as Quintilian remarks, pleaſure ought not of itſelf to be propoſed as a fit motive for action in ſerious diſcourſes, but when it is deſigned to recommend ſomething uſeful, which is the caſe here. So, would any one adviſe another to the purſuit of polite literature, Cicero has furniſhed him with a very ſtrong inducement to it from the pleaſure which attends that ſtudy, when he ſays, "If pleaſure only was propoſed by theſe ſtudies, you would think them an entertainment becoming a man of ſenſe and a gentleman. For other purſuits neither agree with all times, all ages, nor all places; but theſe ſtudies improve youth, delight old age, adorn proſperity, afford a refuge and comfort in adverſity, divert us at home, are no hinderance abroad, ſleep, travel, and retire with us into the country."

2. *Profit*, or advantage. This has no leſs influence upon many perſons than the former; and when it reſpects things truly valuable it is a very juſt and laudable motive. Thus Cicero, when he ſends his *Book of Offices* to his ſon, which he wrote in Latin for his uſe, adviſes him to make the beſt advantage both of his tutor's inſtructions and the converſation at Athens, where he then was; but withal to peruſe his philoſophical treatiſes, which would be doubly uſeful to him, not only upon account of the ſubjects, but likewiſe of the language, as they would enable him to expreſs himſelf upon thoſe arguments in Latin, which before had only been treated of in Greek.

3. *Honour*; than which no argument will ſooner prevail with generous minds, or inſpire them with greater ardour. Virgil has very beautifully deſcribed Hector's ghoſt appearing to Æneas the night Troy was taken, and adviſing him to depart, from this motive of honour:

O goddeſs-born, eſcape by timely flight
The flames and horrors of this fatal night.
The foes already have poſſeſs'd the wall;
Troy nods from high, and totters to her fall.
Enough is paid to Priam's royal name;
More than enough to duty and to fame.
If by a mortal hand my father's throne
Cou'd be defended, 'twas by mine alone.

The argument here made uſe of to perſuade Æneas to leave Troy immediately, is, that he had done all that could be expected from him, either as a good ſubject or brave ſoldier, both for his king and country; which were ſufficient to ſecure his honour: and now there was nothing more to be expected from him when the city was falling, and impoſſible to be ſaved; which, could it have been preſerved by human power, he himſelf had done it.

But although a thing conſidered in itſelf appear beneficial if it could be attained, yet the expediency of undertaking it may ſtill be queſtionable: in which caſe the following heads, taken from the circumſtances which attend it, will afford proper arguments to engage in it.

(1.) The *poſſibility* of ſucceeding may ſometimes be argued, as one motive to this end. So Hannibal endeavoured to convince King Antiochus, that it was poſſible for him to conquer the Romans, if he made Italy the ſeat of the war; by obſerving to him, not only that the Gauls had formerly deſtroyed their city, but that he had himſelf defeated them in every battle he fought with them in that country.

(2.) But an argument founded upon *probability* will be much more likely to prevail. For in many affairs of human life, men are determined either to proſecute them or not, as the proſpect of ſucceſs appears more or leſs probable. Hence Cicero, after the fatal battle at Pharſalia, diſſuades thoſe of Pompey's party, with whom he was engaged, from continuing the war any longer againſt Cæſar; becauſe it was highly improbable, after ſuch a defeat, by which their main ſtrength was broken, that they ſhould be able to ſtand their ground, or meet with better ſucceſs than they had before.

(3.) But further, ſince probability is not a motive ſtrong enough with many perſons to engage in the proſecution of a thing which is attended with conſiderable difficulties, it is often neceſſary to repreſent the facility of doing it, as a further reaſon to induce them to it. And therefore Cicero makes uſe of this argument to encourage the Roman citizens in oppoſing Mark Antony (who upon the death of Cæſar had aſſumed an arbitrary power), by repreſenting to them, that his circumſtances were then deſperate, and that he might eaſily be vanquiſhed.

(4.) Again, If the thing adviſed can be ſhown to be in any reſpect neceſſary, this will render the motive ſtill much ſtronger for undertaking it. And therefore Cicero joins this argument with the former, to prevail with the Roman citizens to oppoſe Antony, by telling them, that "The conſideration before them was, not in what circumſtances they ſhould live, but whether they ſhould live at all, or die with ignominy and diſgrace." This way of reaſoning will ſometimes prevail when all others prove ineffectual. For ſome perſons are not to be moved till things are brought to an extremity, and they find themſelves reduced to the utmoſt danger.

(5.) To theſe heads may be added the conſideration

tion of the *event*, which in ſome caſes carries great weight with it. As when we adviſe to the doing of a thing from this motive, That whether it ſucceed or not, it will yet be of ſervice to undertake it. So after the great victory gained by Themiſtocles over the Perſian fleet at the ſtraits of Salamis, Mardonius adviſed Xerxes to return into Aſia himſelf, leſt the report of his defeat ſhould occaſion an inſurrection in his abſence: but to leave behind him an army of 300,000 men under his command; with which, if he ſhould conquer Greece, the chief glory of the conqueſt would redound to Xerxes; but if the deſign miſcarried, the diſgrace would fall upon his generals.

Theſe are the principal heads which furniſh the orator with proper arguments in giving advice. Cicero, in his oration for the Manilian law, where he endeavours to perſuade the Roman people to chooſe Pompey for their general in the Mithridatic war, reaſons from three of theſe topics, into which he divides his whole diſcourſe; namely, the neceſſity of the war, the greatneſs of it, and the choice of a proper general.—Under the firſt of theſe he ſhows, that the war was neceſſary, from four conſiderations; the honour of the Roman ſtate, the ſafety of their allies, their own revenues, and the fortunes of many of their fellow citizens, which were all highly concerned in it, and called upon them to put a ſtop to the growing power of King Mithridates, by which they were all greatly endangered. So that this argument is taken from the head of *neceſſity*. The ſecond, in which he treats of the greatneſs of the war, is founded upon the topic of *poſſibility*. For though he ſhews the power of Mithridates to be very great, yet not ſo formidable, but that he might be ſubdued; as was evident from the many advantages Lucullus had gained over him and his aſſociates. In the third head, he endeavours to prevail with them to intruſt the management of the war in the hands of Pompey, whom he deſcribes as a conſummate general, for his ſkill in military affairs, courage, authority, and ſucceſs; in all which qualities he repreſents him as ſuperior to any other of their generals whom they could at that time make choice of. The deſign of all which was, to perſuade them, that the had very good reaſon to hope for ſucceſs, and a happy event of the war, under his conduct. So that they whole force of his reaſoning under this head is drawn from *probability*. Theſe are the three general topics which make up that fine diſcourſe. Each of which is indeed ſupported by divers other arguments and conſiderations, which will be obvious in peruſing the oration itſelf, and therefore need not be here enumerated. On the contrary, in another oration he endeavours to diſſuade the ſenate from conſenting to a peace with Mark Antony, becauſe it was baſe, dangerous, and impracticable.

But no ſmall ſkill and addreſs are required in giving advice. For ſince the tempers and ſentiments of mankind, as well as their circumſtances, are very different and various; it is often neceſſary to accommodate the diſcourſe to their inclinations and opinions of things. And therefore the weightieſt arguments are not always the moſt proper and fitteſt to be uſed on all occaſions. Cicero, who was an admirable maſter of this art, and knew perfectly well how to ſuit what he ſaid to the taſte and reliſh of his hearers, in treating upon this ſubject, diſtinguiſhes mankind into two ſorts; the ignorant and unpoliſhed, who always prefer profit to honour; and ſuch as are more civilized and polite, who prefer honour and reputation to all other things.—Wherefore they are to be moved by theſe different views: Praiſe, glory, and virtue, influence the one; while the other is only to be engaged by a proſpect of gain and pleaſure. Beſides, it is plain, that the generality are much more inclined to avoid evils than to purſue what is good; and to keep clear of ſcandal and diſgrace, than to practiſe what is truly generous and noble. Perſons likewiſe of a different age act from different principles; young men for the moſt part view things in a different light from thoſe who are older and have had more experience, and conſequently are not to be influenced by the ſame motives.

Chap. IV. *Of Arguments ſuited to Judicial Diſcourſes.*

18 Of judicial diſcourſes, and the arguments ſuited to them.

In *judicial* controverſies there are two parties; the plaintiff or proſecutor, and the defendant or perſon charged. The ſubject of them is always ſomething paſt. And the end propoſed by them Cicero calls *equity*, or *right* and *equity*; the former of which ariſes from the laws of the country, and the latter from reaſon and the nature of things. For at Rome the prætors had a court of equity, and were empowered, in many caſes relating to property, to relax the rigour of the written laws. But as this ſubject is very copious, and cauſes may ariſe from a great variety of things, writers have reduced them to three heads, which they call *ſtates*, to ſome one of which all judicial proceedings may be referred; namely, *whether a thing is*, *what it is*, or *how it is*. By the *ſtate* of a cauſe therefore is meant the principal queſtion in diſpute, upon which the whole affair depends. Which, if it ſtops in the firſt inquiry, and the defendant denies the fact, the ſtate is called *conjectural*; but if the fact be acknowledged, and yet denied to be what the adverſary calls it, it is termed *definitive*; but if there is no diſpute either about the fact or its name, but only the juſtice of it, it is called the *ſtate of quality*: as was ſhown more largely before (ſee N° 15.) But we there conſidered theſe ſtates only in a general view, and deferred the particular heads of argument proper for each of them to this *judicial* kind of diſcourſes; where they moſt frequently occur, and from which examples may eaſily be accommodated to other ſubjects.

All judicial cauſes are either *private* or *public*. Thoſe are called *private*, which relate to the right of particular perſons; and they are likewiſe called *civil* cauſes, as they are converſant about matters of property.—*Public* cauſes are thoſe which relate to public juſtice and the government of the ſtate: which are alſo called *criminal*, becauſe by them crimes are proſecuted, whether capital, or thoſe of a leſs heinous nature. We ſhall take the heads of the arguments only from this latter kind, becauſe they are more copious, and eaſy to be illuſtrated by examples; from which ſuch as agree to the former, namely, *civil* cauſes, will ſufficiently appear.

1. The *conjectural* ſtate. When the accuſed perſon

denies the fact, there are three things which the proſecutor has to conſider; whether he *would* have done it, whether he *could*, and whether he *did* it. And hence ariſe three topics; from the *will*, the *power*, and the *ſigns* or circumſtances which attended the action. The affections of the mind diſcover the will; as, paſſion, an old grudge, a deſire of revenge, a reſentment of an injury, and the like. Therefore Cicero argues from Clodius's hatred of Milo, that he deſigned his death; and from thence infers, that he was the aggreſſor in the combat between them, wherein Clodius was killed. This is what he principally endeavours to prove, and comes properly under this ſtate: for Milo owned that he killed him, but alleged that he did it in his own defence. So that in regard to this point, Which of them aſſaulted the other? the charge was mutual. The proſpect of advantage may alſo be alleged to the ſame purpoſe. Hence it is ſaid of L. Caſſius, that whenever he ſat as judge in a caſe of murder, he uſed to adviſe and move the court to examine to whom the advantage aroſe from the death of the deceaſed. And Cicero puts this to Antony concerning the death of Cæſar. "If any one (ſays he) ſhould bring you upon trial, and uſe that ſaying of Caſſius, *Cui bono?* 'Who got by it?' look to it, I beſeech you, that you are not confounded." To theſe arguments may be added, hope of impunity, taken either from the circumſtances of the accuſed perſon, or of him who ſuffered the injury. For perſons, who have the advantage of intereſt, friends, power, or money, are apt to think they may eaſily eſcape; as likewiſe ſuch who have formerly committed other crimes with impunity. Thus Cicero repreſents Clodius as hardened in vice, and above all the reſtraint of laws, from having ſo often eſcaped puniſhment upon committing the higheſt crimes. On the contrary, ſuch a confidence is ſometimes raiſed from the condition of the injured party, if he is indigent, obſcure, timorous, or deſtitute of friends; much more if he has an ill reputation, or is loaded with popular hatred and reſentment. It was this preſumption of the obſcurity of Roſcius, who lived in the country, and his want of intereſt at Rome, which encouraged his accuſers to charge him with killing his father, as Cicero ſhows in his defence of him. Laſtly, The temper of a perſon, his views, and manner of life, are conſiderations of great moment in this matter. For perſons of bad morals, and ſuch as are addicted to vice, are eaſily thought capable of committing any wickedneſs. Hence Salluſt argues from the evil diſpoſition and vicious life of Catiline, that he affected to raiſe himſelf upon the ruins of his country.—The ſecond head is the *power* of doing a thing: and there are three things which relate to this, the *place*, the *time*, and *opportunity*. As if a crime is ſaid to have been committed in a private place, where no other perſon was preſent; or in the night; or when the injured perſon was unable to provide for his defence. Under this head may likewiſe be brought in the circumſtances of the perſons; as if the accuſed perſon was ſtronger, and ſo able to overpower the other; or more active, and ſo could eaſily make his eſcape. Cicero makes great uſe of this topic in the caſe of Milo, and ſhows, that Clodius had all the advantages of *place*, *time*, and *opportunity*, to execute his deſign of killing him. The third head comprehends the *ſigns* and circumſtances which either preceded, accompanied, or followed, the commiſſion of the fact. So threats, or the accuſed perſon being ſeen at or near the place before the fact was committed, are circumſtances that may probably precede murder; fighting, crying out, bloodſhed, are ſuch as accompany it; paleneſs, trembling, inconſiſtent anſwers, heſitation, or faltering of the ſpeech, ſomething found upon the perſon accuſed which belonged to the deceaſed, are ſuch as follow it. Thus Cicero proves, that Clodius had threatened the death of Milo, and given out that he ſhould not live above three days at the fartheſt.—Theſe arguments, taken from conjectures, are called *preſumptions*, which, though they do not directly prove that the accuſed perſon committed the fact with which he is charged; yet when laid together, they appeared very ſtrong, ſentence by the Roman law might ſometimes be given upon them, to convict him.

Theſe are the topics from which the proſecutor takes his arguments. Now the buſineſs of the defendant is to invalidate theſe. Therefore ſuch as are brought from the *will*, he either endeavours to ſhow are not true, or ſo weak as to merit very little regard. And he refutes thoſe taken from the *power*, by proving that he wanted either opportunity or ability: as, if he can ſhow, that neither the place nor time inſiſted on was at all proper; or that he was then in another place. In like manner he will endeavour to confute the *circumſtances*, if they cannot be directly denied, by ſhowing that they are not ſuch as do neceſſarily accompany the fact, but might have proceeded from other cauſes, though nothing of what is alleged had been committed; and it will be of great ſervice to aſſign ſome other probable cauſe. But ſometimes the defendant does not only deny that he did the fact, but charges it upon another. Thus Cicero, in his oration for Roſcius, not only defends him from each of theſe three heads, but likewiſe charges the fact upon his accuſers.

2. The *definitive* ſtate, which is principally concerned in defining and fixing the name proper to the fact: though orators ſeldom make uſe of exact definitions, but commonly chooſe larger deſcriptions, taken from various properties of the ſubject or thing deſcribed.

The heads of argument in this ſtate are much the ſame to both parties, For each of them defines the fact his own way, and endeavours to refute the other's definition. We may illuſtrate this by an example from Quintilian: "A perſon is accuſed of ſacrilege, for ſtealing money out of a temple, which belonged to a private perſon." The fact is owned; but the queſtion is, *Whether it be properly ſacrilege?* The proſecutor calls it ſo, becauſe it was taken out of a temple. But ſince the money belonged to a private perſon, the defendant denies it to be ſacrilege, and ſays it is only ſimple theft. Now the reaſon why the defendant uſes this plea, and inſiſts upon the diſtinction, is, becauſe by the Roman law the penalty of theft was only four times the value of what was ſtolen; whereas ſacrilege was puniſhed with death. The proſecutor then forms his definition agreeable to his charge, and ſays, "To ſteal any thing out of a ſacred place is ſacrilege." But the defendant excepts againſt this definition, as defective; and urges, that it does not amount to ſacrilege, unleſs the thing ſtolen was likewiſe ſacred. And this caſe might once, perhaps, have been a matter of controverſy, ſince we find it expreſsly determined in the Pandects, that "An action of ſacrilege ſhould not lie, but only of theft, againſt any one who ſhould ſteal the goods of private perſons depoſited in a temple."

The ſecond thing is the proof brought by each party to ſupport his definition; as in the example given us by Cicero, of one "who carried his cauſe by bribery, and was afterwards proſecuted again upon an action of prevarication." Now, if the defendant was caſt upon this action, he was, by the Roman law, ſubjected to the penalty of the former proſecution. Here the proſecutor defines prevarication to be, *Any bribery or corruption in the defendant, with a deſign to pervert juſtice.* The defendant, therefore, on the other hand, reſtrains it to *bribing only the proſecutor.*

And if this latter ſenſe agrees better with the common acceptation of the word, the proſecutor in the third place pleads the intention of the law, which was to comprehend all bribery in judicial matters under the term of *prevarication.* In anſwer to which the defendant endeavours to ſhow, either from the head of contraries, that a real proſecutor and a prevaricator are uſed as oppoſite terms in the law; or from the etymology of the word, that a prevaricator denotes one who pretends to appear in the proſecution of a cauſe, while in reality he favours the contrary ſide; and conſequently, that money given for this end only can, in the ſenſe of the law, be called *prevarication.*

Laſtly, The proſecutor pleads, that it is unreaſonable that he who does not deny the fact ſhould eſcape by a cavil about a word. But the defendant inſiſts upon his explication as agreeable to the law; and ſays, the fact is miſrepreſented and blackened, by affixing to it a wrong name.

3. The third ſtate is that of *quality,* in which the diſpute turns upon the juſtice of an action. And here the defendant does not deny he did the thing he is charged with; but aſſerts it to be right and equitable, from the circumſtances of the caſe, and the motives which induced him to it.

And, firſt, He ſometimes alleges, the reaſon of doing it was in order to prevent ſome other thing of worſe conſequence, which would otherwiſe have happened. We have an inſtance of this in the life of Epaminondas, who, with two other generals joined in the command with him, marched the Theban army into Peloponneſus againſt the Lacedemonians; but by the influence of a contrary faction at home, their commiſſions were ſuperſeded, and other generals ſent to command the army. But Epaminondas, being ſenſible that, if he obeyed this order at that time, it would be attended with the loſs of the whole army, and conſequently the ruin of the ſtate, refuſed to do it; and having perſuaded the other generals to do the like, they happily finiſhed the war in which they were engaged; and upon their return home, Epaminondas taking the whole matter upon himſelf, on his trial was acquitted. The arguments proper in this caſe are taken from the juſtice, uſefulneſs, or neceſſity, of the action. The accuſer therefore will plead, that the fact was not juſt, profitable, nor neceſſary, conſidered either in itſelf or comparatively with that for the ſake of which it is ſaid to have been done: and he will endeavour to ſhow, that what the defendant aſſigns for the reaſon of what he did might not have happened as he pretends. Beſides, he will repreſent of what ill conſequence it muſt be, if ſuch crimes go unpuniſhed. The defendant, on the other hand, will argue from the ſame heads, and endeavour to prove the fact was juſt, uſeful, or neceſſary. And he will further urge, that no juſt eſtimate can be made of any action, but from the circumſtances which attend it; as the deſign, occaſion, and motives for doing it, which he will repreſent in the moſt favourable light to his own cauſe, and endeavour to ſet them in ſuch a view, as to induce others to think they could not but have done the ſame in the like circumſtances.

Again, The cauſe of an action is ſometimes charged by the defendant upon the party who received the damage, or ſome other perſon, who either made it neceſſary, or enjoined him to do it. The firſt of theſe was Milo's plea for killing Clodius, becauſe he aſſaulted him with a deſign to take away his life. Here the fact is not denied, as in the caſe of Roſcius abovementioned, under the *conjectural* ſtate; but juſtified from the reaſon of doing it. For that an aſſaſſin might be juſtly killed, Cicero ſhows both from law and reaſon The accuſer, therefore, in ſuch a caſe, will, if there be room for it, deny the truth of this allegation. So the friends of Clodius affirmed that Milo was the aggreſſor, and not Clodius; which Cicero, in his defence of Milo, principally labours to refute. In the ſecond caſe, the proſecutor will ſay, No one ought to offend becauſe another has offended firſt; which defeats the courſe of public juſtice, renders the laws uſeleſs, and deſtroys the authority of the magiſtrate. The defendant, on the other hand, will endeavour to repreſent the danger and neceſſity of the caſe, which required an immediate remedy, and in that manner; and urges, that it was vain and impracticable to wait for redreſs in the ordinary way, and therefore no ill conſequence can ariſe to the public. Thus Cicero, in defending Sextius, who was proſecuted for a riot in bringing armed men into the forum, ſhows that his deſign was only to repel force with force; which was then neceſſary, there being no other means left for the people to aſſemble, who were excluded by a mob of the contrary party. Of the third caſe we have alſo an example in Cicero, who tells us, that, "in making a league between the Romans and Samnites, a certain young nobleman was ordered by the Roman general to hold the ſwine (deſigned for a ſacrifice); but the ſenate afterwards diſapproving the terms, and delivering up their general to the Samnites, it was moved, Whether this young man ought not likewiſe to be given up." Thoſe who were for it might ſay, that, to allege the command of another, is not a ſufficient plea for doing an ill action; and this is what the Roman law now expreſsly declares. But in anſwer to that, it might be replied, that it was his duty to obey the command of his general, who was anſwerable for his own orders, and not thoſe who were obliged to execute them; and therefore, to give up this young nobleman would be to puniſh one perſon for the fault of another.

Laſtly, A fact is ſometimes rather excuſed than defended, by pleading that it was not done deſignedly, or with any ill intent. This is called *conceſſion;* and conſiſts of two parts, *apology* and *entreaty*. The former repreſents the matter as the effect of inadvertency, chance, or neceſſity. Ariſtotle gives us an example of inadvertency or imprudence in a woman at Athens, who gave a young man a love potion, which killed him; for which ſhe was tried, but acquitted: though afterwards this was made criminal by the Roman law. The caſe of Adraſtus, as related by Herodotus, is an inſtance of chance; who being intruſted by Crœſus with the care of his ſon, as they were hunting, killed him accidentally with a javelin which he threw at a boar. It is neceſſity, when a perſon excuſes his making a default, from ſtreſs of weather, ſickneſs, or the like. Thus Cicero pleaded his illneſs, contracted by the fatigue of a long journey, as an excuſe for not appearing in the ſenate upon the ſummons of Mark Antony, who threatened to oblige him to it by pulling his houſe down. But what the defendant here attributes to inadvertency, chance, or neceſſity, the oppoſite party will attribute to deſign, negligence, or ſome other culpable reaſon; and repreſent it as a matter injurious to the public to introduce ſuch precedents; and alſo produce inſtances, if that can be done, where the like excuſes have not been admitted. On the other hand, the defendant will inſiſt on his innocence, and ſhow the hardſhip and ſeverity of judging men's actions rather by the event, than from the intention: that ſuch a procedure makes no difference between the innocent and the guilty; but muſt neceſſarily involve many honeſt men in ruin and deſtruction, diſcourage all virtuous and generous deſigns, and turn greatly to the prejudice of human ſociety. He will alſo conſider the inſtances alleged by the accuſer, and ſhow the difference between them and his own caſe. And, laſtly, He will have recourſe to entreaty, or a ſubmiſſive addreſs to the equity and clemency of the court, or party offended, for pardon; as Cicero has done in his oration to Cæſar, in favour of Ligarius.

Chap. V. *Of the Character and Addreſs of an Orator.*

19 Propriety of manners neceſſary in an orator, both with reſpect to character and addreſs.

Having conſidered and explained the firſt part of Invention, which furniſh the orator with ſuch arguments as are neceſſary for the proof of his ſubject, we are next to ſhow what are the proper means to conciliate the minds of his hearers; to gain their affection; and to recommend both himſelf, and what he ſays, to their good opinion and eſteem. For the parts of invention are commonly thus diſtinguiſhed; that the firſt reſpects the *ſubject* of the diſcourſe, the ſecond the *ſpeaker*, and the third the *hearers*. Now the ſecond of theſe, what we have at preſent to explain, is by Quintilian called a *propriety of manners*. And in order to expreſs this it is neceſſary, as he tells us, "that every thing appear eaſy and natural, and the diſpoſition of the ſpeaker be diſcovered by his words." We may form an eaſy conception of this from the conduct of ſuch perſons as are moſt nearly concerned in each others welfare. As when relations or friends converſe together upon any affairs of importance, the temper and diſpoſition of the ſpeaker plainly ſhows itſelf by his words and manner of addreſs. And what nature here directs to without colouring or diſguiſe, the orator is to endeavour to perform by his art. Though indeed, if what a perſon ſays be inconſiſtent with his uſual conduct and behaviour at other times, he cannot expect it ſhould gain much credit, or make any deep impreſſion upon his hearers; which may be one reaſon why the ancient rhetoricians make it ſo neceſſary a qualification in an orator, that he be a good man; ſince he ſhould always be conſiſtent with himſelf, and, as we ſay, talk in character. And therefore it is highly requiſite, that he ſhould not only gain the ſkill of aſſuming thoſe qualities which the nature and circumſtances of his diſcourſe require him to expreſs; but likewiſe, that he ſhould uſe his utmoſt endeavours to get the real habits implanted in his mind. For as by this means they will be always expreſſed with greater eaſe and facility; ſo, by appearing conſtantly in the courſe of his life, they will have more weight and influence upon particular occaſions.

Now there are four qualities, more eſpecially ſuited to the character of an orator, which ſhould always appear in his diſcourſes, in order to render what he ſays acceptable to his hearers; and theſe are, *wiſdom*, *integrity*, *benevolence*, and *modeſty*.

1. *Wiſdom* is neceſſary; becauſe we eaſily give into thoſe whom we eſteem wiſer and more knowing than ourſelves. Knowledge is very agreeable and pleaſant to all, but few make very great improvements in it; either by reaſon they are employed in other neceſſary affairs, and the mind of man cannot attend to many things at once; or becauſe the way to knowledge at firſt is hard and difficult, ſo that perſons either do not care to enter upon the purſuit of it, or, if they do, they are many times ſoon diſcouraged, and drop it, for want of ſufficient reſolution to ſurmount its difficulties. Such, therefore, as either cannot, or do not care to themſelves the trouble of examining into things th ſelves, muſt take up with the repreſentation of others; and it is an eaſe to them to hear the opinion of perſons whom they eſteem wiſer then themſelves. No one loves to be deceived; and thoſe who are fearful of being miſled, are pleaſed to meet with a perſon in whoſe wiſdom, as they think, they can ſafely truſt. The character of wiſdom therefore is of great ſervice to an orator, ſince the greater part of mankind are ſwayed by authority rather than arguments.

2. But this of itſelf is not ſufficient, unleſs the opinion of *integrity* be joined with it. Nay, ſo far from it, that the greater knowledge and underſtanding a man is ſuppoſed to have, unleſs he likewiſe have the character of an honeſt man, he is often the more ſuſpected. For knowledge without honeſty, is generally thought to diſpoſe a perſon, as well as qualify him, to deceive.

3. And to both theſe qualities the appearance of kindneſs and *benevolence* ſhould likewiſe be added. For though a perſon have the reputation of wiſdom and honeſty, yet if we apprehend he is either not well affected to us, or at leaſt regardleſs of our intereſt, we are in many caſes apt to be jealous of him. Mankind are naturally ſwayed by their affections, and much in-

fluenced through love or friendſhip; and therefore nothing has a greater tendency to induce perſons to credit what is ſaid, than intimations of affection and kindneſs. The beſt orators have been always ſenſible what great influence the expreſſions of kindneſs and benevolence have upon the minds of others, to induce them to believe the truth of what they ſay; and therefore they frequently endeavour to impreſs them with the opinion of it. Thus Demoſthenes begins his celebrated oration for Cteſiphon. "It is my hearty prayer (ſays he) to all the deities, that this my defence may be received by you with the ſame affection which I have always expreſſed for you and your city." And it is a very fine image of it which we have in Cicero, where, in order to influence the judges in favour of Milo, he introduces him ſpeaking thus, as became a brave man, and a patriot, even upon the ſuppoſition he ſhould be condemned by them: "I bid my fellow citizens adieu: may they continue flouriſhing and proſperous; may this famous city be preſerved, my moſt dear country, however it has treated me; may my fellow citizens enjoy peace and tranquillity without me, ſince I am not to enjoy it with them, though I have procured it for them: I will withdraw, I will be gone."

4. *Modeſty.* It is certain, that what is modeſtly ſpoken is generally better received than what carries in it an air of boldneſs and confidence. Moſt perſons, though ignorant of a thing, do not care to be thought ſo; and would have ſome deference paid to their underſtanding. But he who delivers himſelf in an arrogant and affirming way ſeems to upbraid his hearers with ignorance, while he does not leave them to judge for themſelves, but dictates to them, and as it were demands their aſſent to what he ſays; which is certainly a very improper method to win upon them. For not a few, when convinced of an error in ſuch a way, will not own it; but will rather adhere to their former opinion, than ſeem forced to think right, when he gives another the opportunity of a triumph. A prudent orator therefore will behave himſelf with modeſty, that he may not ſeem to inſult his hearers; and will ſet things before them in ſuch an engaging manner, as may remove all prejudice either from his perſon or what he aſſerts. This is particularly neceſſary in the exordium of a diſcourſe. If the orator ſet out with an air of arrogance and oſtentation, the ſelf-love and pride of the hearers will be preſently awakened, and will follow him with a very ſuſpicious eye throughout all his progreſs. His modeſty ſhould diſcover itſelf not only in his expreſſions at the beginning, but in his whole manner; in his looks, in his geſtures, in the tone of his voice. Every auditory take in good part thoſe marks of reſpect and awe, which are paid to them by one who addreſſes them. Indeed the modeſty of an introduction ſhould never betray any thing mean or abject. It is always of great uſe to an orator, that together with modeſty and deference to his hearers, he ſhould ſhow a certain ſenſe of dignity, ariſing from a perſuaſion of the juſtice or importance of the ſubject on which he is to ſpeak. For to ſpeak timorouſly, and with heſitation, deſtroys the credit of what is offered; and ſo far as the ſpeaker ſeems to diſtruſt what he ſays himſelf, he often induces others to do the like.

But, as has been ſaid already, great care is to be taken that theſe characters do not appear feigned and counterfeit. For what is fictitious can ſeldom be long concealed. And if this be once diſcovered, it makes all that is ſaid ſuſpected, how ſpecious ſoever it may otherwiſe appear.

It is further neceſſary, that the orator ſhould know the world, and be well acquainted with the different tempers and diſpoſitions of mankind. Nor indeed can any one reaſonably hope to ſucceed in this province, without well conſidering the circumſtances of time and place, with the ſentiments and diſpoſitions of thoſe to whom he ſpeaks; which, according to Ariſtotle, may be diſtinguiſhed four ways, as they diſcover themſelves by the ſeveral *affections*, *habits*, *ages*, and *fortunes* of mankind. And each of theſe require a different conduct and manner of addreſs.

The *affections* denote certain emotions of the mind, which, during their continuance, give a great turn to the diſpoſition. For love prompts to one thing, and hatred to another. The like may be ſaid of anger, lenity, and the reſt of them.

Perſons differ likewiſe according to the various *habits* of their mind. So a juſt man is inclined one way, and an unjuſt man another; a temperate man to this, and an intemperate man to the contrary.

And as to the ſeveral *ages* of men, Ariſtotle has deſcribed them very accurately; and how perſons are differently affected in each of them. He divides the lives of men, conſidered as hearers, into three ſtages; youth, middle age, and old age.—Young men, he ſays, have generally ſtrong paſſions, and are very eager to obtain what they deſire; but are likewiſe very mutable, ſo that the ſame thing does not pleaſe them long. They are ambitious of praiſe, and quick in their reſentments: laviſh of their money, as not having experienced the want of it: frank and open, becauſe they have not often been deceived; and credulous for the ſame reaſon. They readily hope the beſt, becauſe they have not ſuffered much, and are therefore not ſo ſenſible of the uncertainty of human affairs; for which reaſon they are likewiſe more eaſily deceived. They are modeſt, from their little acquaintance with the world. They love company and cheerfulneſs, from the briſkneſs of their ſpirits. In a word, they generally exceed in what they do; love violently, hate violently, and act in the ſame manner through the reſt of their conduct.—The diſpoſition of old men is generally contrary to the former. They are cautious, and enter upon nothing haſtily; having in the courſe of many years been often impoſed upon; having often erred, and experienced the prevailing corruption of human affairs; for which reaſon they are likewiſe ſuſpicious, and moderate in their affections either of love or hatred. They purſue nothing great and noble, and regard only the neceſſaries of life. They love money; having learned by experience the difficulty of getting it, and how eaſily it is loſt. They are fearful, which makes them provident. Commonly full of complaints, from bodily infirmities, and a deficiency of ſpirits. They pleaſe themſelves rather with the memory of what is paſt, than with any future proſpect; having ſo ſhort a view of life before them, in compariſon of what is already gone: for which reaſon alſo, they love to talk of things paſt; and prefer them to what is preſent, of which they have but little reliſh, and know they muſt ſhortly leave them. They are ſoon angry, but not to exceſs. Laſtly, They are compaſſionate, from a ſenſe of their own infirmities, which makes them think themſelves of all perſons moſt expoſed.—Perſons of a middle age, betwixt theſe two extremes, as they are freed from the raſhneſs and temerity of youth, ſo they have not yet ſuffered the decays of old age. Hence in every-thing they generally obſerve a better conduct. They are neither ſo haſty in their aſſent as the one, nor ſo minutely ſcrupulous as the other, but weigh the reaſons of things. They regard a decency in their actions; are careful and induſtrious; and as they undertake what appears juſt and laudable upon better and more deliberate conſideration than young perſons, ſo they purſue them with more vigour and reſolution than thoſe who are older.

As to the different *fortunes* of mankind, they may be conſidered as noble, rich, or powerful; and the contrary to theſe.—Thoſe of high birth, and noble extraction, are generally very tender of their honour, and ambitious to increaſe it; it being natural for all perſons to deſire an addition to thoſe advantages of which they find themſelves already poſſeſſed. And they are apt to conſider all others as much their inferiors, and therefore expect great regard and deference ſhould be ſhown them.—Riches, when accompanied with a generous temper, command reſpect from the opportunities they give of being uſeful to others; but they uſually elate the mind, and occaſion pride. For as money is commonly ſaid to command all things, thoſe who are poſſeſſed of a large ſhare of it, expect others ſhould be at their beck: ſince they enjoy that which all deſire, and which moſt perſons make the main purſuit of their lives to obtain.—But nothing is more apt to ſwell the mind than power. This is what all men naturally covet, even when perhaps they would not uſe it. But the views of ſuch perſons are generally more noble and generous than of thoſe who only purſue riches and the heaping up of money. A ſtate contrary to theſe gives a contrary turn of mind; and in lower life, perſons diſpoſitions uſually differ according to their ſtation and circumſtances. A citizen and a courtier, a merchant and a ſoldier, a ſcholar and a peaſant, as their purſuits are different, ſo is generally their turn and diſpoſition of mind.

It is the orator's buſineſs, therefore, to conſider theſe ſeveral characters and circumſtances of life, with the different bias and way of thinking they give to the mind; that he may ſo conduct himſelf in his behaviour and manner of ſpeaking, as will render him moſt acceptable, and gain him the good eſteem of thoſe whom he addreſſes.

Chap. VI. *Of the Paſſions.*

20
It is neceſſary, though difficult, to engage the intereſt of the paſſions.

As it is often highly neceſſary for the orator, ſo it requires his greateſt ſkill, to engage the paſſions in his intereſt. Quintilian calls this *the ſoul and ſpirit of his art*. And, doubtleſs, nothing more diſcovers its empire over the minds of men, than this power to excite, appeaſe, and ſway their paſſions, agreeably to the deſign of the ſpeaker. Hence we meet with the characters of *admirable*, *divine*, and other ſplendid titles, aſcribed to eloquence by ancient writers. It has indeed been objected by ſome, that whatever high encomiums may be given of this art by the admirers of it, it is however diſingenuous to deceive and impoſe upon mankind, as thoſe ſeem to do, who, by engaging their paſſions, give a bias to their minds, and take them off from the conſideration of the truth; whereas every thing ſhould be judged of from the reaſons brought to ſupport it, by the evidence of which it ought to ſtand or fall. But in anſwer to this, it may be conſidered that all fallacy is not culpable. We often deceive children for their good; and phyſicians ſometimes impoſe on their patients, to come at a cure. And why, therefore, when perſons will not be prevailed with by reaſon and argument, may not an orator endeavour, by engaging their paſſions, to perſuade them to that which is for their advantage? Beſides, Quintilian makes it a neceſſary qualification of an orator, that he be an honeſt man, and one who will not abuſe his art. But ſince thoſe of a contrary character will leave no methods untried in order to carry their point, it is requiſite for thoſe who deſign well to be acquainted with all their arts, without which they will not be a match for them; as in military affairs it is highly advantageous for the general of an army to get himſelf informed of all the deſigns and ſtratagems of the enemy, in order to counteract them. Indeed this part of oratory is not neceſſary at all times, nor in all places. The better prepared perſons are to conſider truth, and act upon the evidence of it, the leſs occaſion there appears for it. But the greater part of mankind, either do not duly weigh the force of arguments, or refuſe to act agreeably to their evidence. And where this is the caſe, that perſons will neither be convinced by reaſon, nor moved by the authority of the ſpeaker, the only way left to put them upon action, is to engage their paſſions. For the paſſions are to the mind, what the wind is to a ſhip: they move, and carry it forward; and he who is without them, is in a manner without action, dull and lifeleſs. There is nothing great or noble to be performed in life, wherein the paſſions are not concerned. The Stoics, therefore, who were for eradicating the paſſions, both maintained a thing in itſelf impoſſible, and which, if it was poſſible, would be of the greateſt prejudice to mankind. For while they appeared ſuch zealous aſſertors of the government of reaſon, they ſcarce left it any thing to govern; for the authority of reaſon is principally exerciſed in ruling and moderating the paſſions, which, when kept in a due regulation, are the ſprings and motives to virtue. Thus hope produces patience, and fear induſtry; and the like might be ſhown of the reſt. The paſſions therefore are not to be extirpated, as the Stoics aſſerted, but put under the direction and conduct of reaſon. Indeed where they are ungovernable, and reſiſt the controul of reaſon, they are, as ſome have fitly called them, *diſeaſes of the mind*; and frequently hurry men into vice, and the greateſt misfortunes of life: juſt as the wind, when it blows moderately, carries on the ſhip; but if it be too boiſterous and violent, may overſet her. The charge therefore brought againſt this art, for giving rules to influence the paſſions, appears groundleſs and unjuſt; ſince the proper uſe of the paſſions is, not to hinder the exerciſe of reaſon, but engage men to act agreeably to reaſon. And if an ill uſe be ſometimes made of this, it is not the fault of the art but of the artiſt.

We ſhall here conſider the paſſions, as they may be ſeparately referred, either to *demonſtrative*, *deliberative*, or *judicial* diſcourſes; though they are not wholly confined to any of them.

21 Of the paſſions which may be referred to demonſtrative diſcourſes.

1. To the *demonſtrative* kind, we may refer *joy* and *ſorrow*, *love* and *hatred*, *emulation* and *contempt*.

Joy is an elation of the mind, ariſing from a ſenſe of ſome preſent good. Such a reflection naturally creates a pleaſant and agreeable ſenſation, which ends in a delightful calm and ſerenity. This is heightened by a deſcription of former evils, and a compariſon between them and the preſent felicity. Thus Cicero endeavours to excite in the minds of his fellow citizens the higheſt ſenſe of joy and delight at Catiline's departure from Rome, by repreſenting to them the imminent danger which threatened both them and the city while he continued among them.

Sorrow, on the contrary, is an uneaſineſs of mind ariſing from a ſenſe of ſome preſent evil. This paſſion has generally a place in funeral diſcourſes. And it may be heightened, like the former, by compariſon, when any paſt happineſs is ſet in oppoſition to a preſent calamity. Hence Cicero aggravates the ſorrow at Rome occaſioned by the death of Metellus, from his character, and great ſervices to the public, while living.

Love excites us to eſteem any perſon for ſome excellency, and to do him all the good in our power. It is diſtinguiſhed from *friendſhip*, which is mutual; and therefore love may continue where friendſhip is loſt; that is, the affection may remain on one ſide. And when we aſſiſt a perſon from no other motive but to do him a kindneſs, Ariſtotle calls this *good will*. Love takes its riſe from a variety of cauſes. Generoſity, benevolence, integrity, gratitude, courteſy, and other ſocial virtues, are great incitements to love any one endued with ſuch qualities. And perſons generally love thoſe who are of a like diſpoſition with themſelves and purſue the ſame views. It is therefore the chief [illegible] of a flatterer to ſuit himſelf in every thing to the [illegible] of the perſon whoſe good graces he courts. When the orator would excite this affection towards any perſon, it is proper to ſhow, that he is poſſeſſed of at leaſt ſome, if not all, of theſe agreeable qualities. When the conſpirators with Catiline were to be brought to juſtice, Cicero was very ſenſible of the envy he ſhould contract on that account, and how neceſſary it was for him to ſecure the love of the Roman ſenate for his ſupport and protection in that critical juncture. And this he endeavours to do in his fourth oration againſt Catiline, by repreſenting to them in the moſt pathetic manner, that all the labours he underwent, the difficulties he conflicted with, and the dangers to which he was expoſed on that account, were not for his own ſake, but for their ſafety, quiet, and happineſs.

Hatred is oppoſed to love, and produced by the contrary diſpoſitions. And therefore perſons hate thoſe who never did them any injury, from the ill opinion they have of their baſe and vicious inclinations. So that the way to excite this paſſion is by ſhowing that any one has committed ſome heinous fact with an ill intent. And the more nearly affected perſons are by ſuch actions, in what they account of the greateſt concern, the higher in proportion their hatred riſes. Since life therefore is eſteemed the moſt valuable good, Cicero endeavours to render Mark Antony odious to the citizens of Rome, by deſcribing his cruelty.

Emulation is a diſquiet, occaſioned by the felicity of another, not becauſe he enjoys it, but becauſe we deſire the like for ourſelves. So that this paſſion is in itſelf good and laudable, as it engages men to purſue thoſe things which are ſo. For the proper objects of emulation are any advantages of mind, body, or fortune, acquired by ſtudy or labour.

Emulation therefore is excited by a lively repreſentation of any deſirable advantages which appear to be attainable, from the example of others who are or have been poſſeſſed of them. But where the felicity of another occaſions an uneaſineſs, not from the want of it, but becauſe he enjoys it, this paſſion is called *envy*, which the ancients deſcribe as a hideous monſter, feeding upon itſelf, and being its own tormentor. Ariſtotle juſtly obſerves, that it moſt uſually affects ſuch perſons as were once upon a level with thoſe they envy. For moſt men naturally think ſo well of themſelves, that they are uneaſy to ſee thoſe who were formerly their equals advanced above them. But, as this is a baſe and vicious paſſion, the orator is not to be informed how to excite it, but how to leſſen or remove it. And the method preſcribed by Cicero for this purpoſe is, to ſhow that the things which occaſioned it have not happened to the envied perſon undeſervedly, but are the juſt reward of his induſtry or virtue; that he does not ſo much convert them to his own profit or pleaſure, as to the benefit of others; and that the ſame pains and difficulties are neceſſary to preſerve them with which they were at firſt acquired.

Contempt is oppoſed to *emulation*, and ariſes from miſconduct in things not of themſelves vicious: As where a perſon either acts below his ſtation and character, or affects to do that for which he is not qualified. Thus Cicero endeavours to expoſe Cæcilius, and bring him into contempt of the court, for pretending to rival him in the accuſation of Verres, for which he was altogether unfit.

22 Of the paſſions which may be referred to deliberative diſcourſes.

2. To *deliberative* diſcourſes may be referred *fear*, *hope*, and *ſhame*.

Fear ariſes from the apprehenſion of ſome great and impending evil. For the greateſt evils, while they appear at a diſtance, do not much affect us. Such perſons occaſion fear, who are poſſeſſed of power, eſpecially if they have been injured, or apprehend ſo: likewiſe thoſe who are addicted to do injuries, or who bear us an ill will. And the examples of others, who have ſuffered in a like caſe, or from the ſame perſons, help to excite fear. From the circumſtances therefore either of the thing or perſon, it will not be difficult for the orator to offer ſuch arguments as may be proper to awaken this paſſion. So Demoſthenes, when he would perſuade the Athenians to put themſelves in a condition of defence againſt King Philip, enumerates the ſeveral acts of hoſtility already committed by him againſt the neighbouring ſtates. And becauſe men's private concerns generally more affect them than what relates to the public, it is proper ſometimes to ſhow the neceſſary connexion theſe have with each other, and how the ruin of one draws the other after it.

The contrary paſſion to *fear* is *hope*; which ariſes either from a proſpect of ſome future good, or the apprehenſion of ſafety from thoſe things which occaſion our fear. Young perſons are eaſily induced to hope the beſt, from the vigour of their ſpirits. And thoſe who have eſcaped former dangers are encouraged to hope for the like ſucceſs for the future. The examples of others alſo, eſpecially of wiſe and conſiderate men, have often the ſame good effect. To find them calm and ſedate when expoſed to the like dangers naturally creates confidence and the hopes of ſafety. But nothing gives perſons ſuch firmneſs and ſteadineſs of mind under the apprehenſion of any difficulties, as a conſciouſneſs of their own integrity and innocence. Let dangers come from what quarter they will, they are beſt prepared to receive them. They can calmly view an impending tempeſt, obſerve the way of its approach, and prepare themſelves in the beſt manner to avoid it. In Cicero's oration for the Manilian law, he encourages the Roman citizens to hope for ſucceſs againſt Mithridates, if they choſe Pompey for their general, from the many inſtances of his former ſucceſſes which he there enumerates.

Shame ariſes from the apprehenſion of thoſe things that hurt a perſon's character. *Modeſty* has been wiſely implanted in mankind by the great Author of nature, as a guardian of virtue, which ought for this reaſon to be cheriſhed with the greateſt care; becauſe, as Seneca has well obſerved, "if it be once loſt, it is ſcarce ever to be recovered." Therefore the true cauſe or foundation of ſhame is any thing baſe or vicious; for this wounds the character, and will not bear reflection. And he muſt arrive at no ſmall degree of inſenſibility, who can ſtand againſt ſuch a charge, if he be conſcious to himſelf that it is juſt. Therefore, to deter perſons from vicious actions, or to expoſe them for the commiſſion of them, the orator endeavours to ſet them in ſuch a light as may moſt awaken this paſſion, and give them the greateſt uneaſineſs by the reflection. And becauſe the bare repreſentation of the thing itſelf is not always ſufficient for this purpoſe, he ſometimes enforces it by enlarging the view, and introducing thoſe perſons as witneſſes of the fact for whom they are ſuppoſed to have the greateſt regard. Thus, when ſome of the Athenians, in an arbitration about certain lands which had been referred to them by the contending parties, propoſed it as the ſhorteſt way of deciding the controverſy, to take the poſſeſſion of them in their own hands; Cydias, a member of the aſſembly, to diſſuade them from ſuch an unjuſt action, deſired them to imagine themſelves at that time in the general aſſembly of the ſtates of Greece (who would all hear of it ſhortly), and then conſider how it was proper to act. But where perſons labour under an exceſs of modeſty which prevents them from exerting themſelves in things fit and laudable, it may ſometimes be neceſſary to ſhow that it is faulty and ill grounded. On the other hand, *immodeſty*, or impudence, which conſiſts in a contempt of ſuch things as affect the reputation, can never be too much diſcouraged and expoſed. And the way of doing this is to make uſe of ſuch arguments as are moſt proper to excite ſhame. We have a very remarkable inſtance of it in Cicero's ſecond Philippic, wherein he affixes this character upon Mark Antony through every ſcene of his life.

23 Of the paſſions which may be referred to *judicial* diſcourſes.

3 To *judicial* diſcourſes, may be referred *anger* and *lenity*, *pity*, and *indignation*.

Anger is a reſentment, occaſioned by ſome affront, or injury, done without any juſt reaſon. Now men are more inclined to reſent ſuch a conduct, as they think they leſs deſerve it. Therefore perſons of diſtinction and figure, who expect a regard ſhould be paid to their character, can the leſs bear any indications of contempt. And thoſe who are eminent in any profeſſion or faculty, are apt to be offended if reflections are caſt either upon their reputation or art. Magiſtrates alſo, and perſons in public ſtations, ſometimes think it incumbent on them to reſent indignities for the ſupport of their office. But nothing ſooner inflames this paſſion, than if good ſervices are rewarded with ſlights and neglect. The inſtance of Narſes, the Roman general, is remarkable in this kind; who, after he had been ſucceſsful in his wars with the Goths, falling under the diſpleaſure of the emperor Juſtin, was removed from the government of Italy, and received by the empreſs with this taunt, *That he muſt be ſent to weave among the girls*; which ſo provoked him, that he ſaid he would weave ſuch a web, as they would never be able to unravel. And accordingly, he ſoon after brought down the Longobards, a people of Germany, into Italy; where they ſettled themſelves in that part of the country, which from them is now called *Lombardy*. (See NARSES.) The time and place in which an injury was done, and other circumſtances that attended it, may likewiſe contribute very much to heighten the fact. Hence Demoſthenes, in his oration againſt Midias, endeavours to aggravate the injury of being ſtruck by him, both as he was then a magiſtrate, and becauſe it was done at a public feſtival. From hence it appears, that the perſons who moſt uſually occaſion this paſſion are ſuch as neglect the rules of decency, contemn and inſult others, or oppoſe their inclinations; as likewiſe the ungrateful, and thoſe who violate the ties of friendſhip, or requite favours with injuries. But when the orator endeavours to excite anger, he ſhould be careful not to exceed due bounds in aggravating the charge, leſt what he ſays appear rather to proceed from prejudice, than a ſtrict regard to the demerit of the action.

Lenity is the remiſſion of anger. The deſigns of men's actions are principally to be regarded; and therefore what is done ignorantly, or through inadvertency, is ſooner forgiven. Alſo to acknowledge a fault, ſubmit, and aſk pardon, are the ready means to take off reſentment. For a generous mind is ſoon cooled by ſubmiſſion. Beſides, he who repents of his fault, does really give the injured party ſome ſatisfaction, by puniſhing himſelf; as all repentance is attended with grief and uneaſineſs of mind, and this is apt very much to abate the deſire of revenge. As, on the contrary, nothing is more provoking, than when the offender either audaciouſly juſtifies the fact, or confidently denies it. Men are likewiſe wont to lay aſide their reſentment, when their adverſaries happen by ſome other means to ſuffer what they think a ſufficient ſatisfaction. Laſtly, Eaſy circumſtances, a lucky incident, [illegible] any thing which gives the mind a turn to m[illegible] and pleaſure, has a natural tendency to remove anger. For anger is accompanied with pain and uneaſineſs, which very ill ſuit joy and cheerfulneſs. The orator, therefore, in order to aſſuage and pacify the minds of his auditors, will endeavour to leſſen their opinion of the fault, and by that means to take off the edge of their reſentment. And to this purpoſe, it will be proper either to repreſent that the thing was not deſigned, or that the party is ſorry for it; or to mention his former ſervices; as alſo to ſhow the credit and reputation which will be gained by a generous forgiveneſs. And this laſt topic is very artfully wrought up by Cicero, in his addreſs to Cæſar, in favour of Ligarius.

Pity ariſes from the calamities of others, by reflecting, that we ourſelves are liable to the like misfortunes. So that evils, conſidered as the common lot of human nature, are principally the cauſe of pity. And this makes the difference between *pity* and *good will*, which ariſes merely from a regard to the circumſtances of thoſe who want our aſſiſtance. But conſidering the uncertainty of every thing about us, he muſt ſeem in a manner diveſted of humanity, who has no compaſſion for the calamities of others; ſince there is no affliction which happens to any man, but either that, or ſome other as great, may fall upon himſelf. But thoſe perſons are generally ſooneſt touched with this paſſion, who have met with misfortunes themſelves. And by how much greater the diſtreſs is, or by how much the perſon appears leſs deſerving it, the higher pity does it excite; for which reaſon, perſons are generally moſt moved at the misfortunes of their relations and friends, or thoſe of the beſt figure and character. The orator, therefore, in order to excite the greater pity, will endeavour to heighten the idea of the calamity, from the ſeveral circumſtances both of the thing itſelf and the perſon who labours under it. A fine example of this may be ſeen in Cicero's defence of Muræna, *Cap.* 40, &c.

Indignation, as oppoſed to *pity*, is an uneaſineſs at the felicity of another who does not ſeem to deſerve it. But this reſpects only external advantages, ſuch as riches, honours, and the like; for virtues cannot be the object of this paſſion. Ariſtotle therefore ſays, "that pity and indignation are generally to be found in the ſame perſons, and are both evidences of a good diſpoſition." Now the orator excites this paſſion, by ſhowing the perſon to be unworthy of that felicity which he enjoys. And as, in order to move compaſſion, it is ſometimes of uſe to compare the former happy ſtate of the perſon with his preſent calamity; ſo here, the greater indignation is raiſed, by comparing his former mean circumſtances with his preſent advancement: as Cicero does in the caſe of Vatinius.

Theſe are the paſſions with which an orator is principally concerned. In addreſſing to which, not only the greateſt warmth and force of expreſſion is often neceſſary; but he muſt likewiſe firſt endeavour to impreſs his own mind with the ſame paſſion he would excite in others.

A man may convince, and even perſuade others to act, by mere reaſon and argument. But that degree of eloquence which gains the admiration of mankind, and properly denominates one an orator, is never found without warmth or paſſion. Paſſion, when in ſuch a degree as to rouſe and kindle the mind, without throwing it out of the poſſeſſion of itſelf, is univerſally found to exalt all the human powers. It renders the mind infinitely more enlightened, more penetrating, more vigorous and maſterly, than it is in its calm moments. A man, actuated by a ſtrong paſſion, becomes much greater than he is at other times. He is conſcious of more ſtrength and force; he utters greater ſentiments, conceives higher deſigns, and executes them with a boldneſs and a felicity of which on other occaſions he could not think himſelf capable. But chiefly, with reſpect to perſuaſion, is the power of paſſion felt. Almoſt every man in paſſion is eloquent. Then he is at no loſs for words and arguments. He tranſmits to others, by a ſort of contagious ſympathy, the warm ſentiments which he feels; his looks and geſtures are all perſuaſive; and nature here ſhows herſelf infinitely more powerful than art. This is the foundation of that juſt and noted rule, *Si vis me flere, dolendum eſt primum ipſi tibi.*

The warmth, however, which we expreſs, muſt be ſuited to the occaſion and the ſubject; for nothing can be more prepoſterous than an attempt to introduce great vehemence into a ſubject, which is either of ſlight importance, or which, by its nature, requires to be treated of calmly. A temperate tone of ſpeech is that for which there is moſt frequent occaſion; and he who is on every ſubject paſſionate and vehement, will be conſidered as a bluſterer, and meet with little regard.

PART II. OF DISPOSITION.

As *Invention* ſupplies the orator with neceſſary materials, ſo *Diſpoſition* directs him how to place them in the moſt proper and ſuitable order. Diſpoſition, therefore, conſidered as a part of oratory, naturally follows invention. And what is here chiefly intended by it is, the placing the ſeveral parts of a diſcourſe in a juſt method and dependence upon one another.

Writers are not all agreed in determining the parts of an oration; though the difference is rather in the manner of conſidering them, than in the things themſelves. But Cicero, whom we ſhall here follow, mentions ſix, namely, *Introduction*, *Narration*, *Propoſition*, *Confirmation*, *Confutation*, and *Concluſion*.

Chap. I. *Of the Introduction.*

24 Introduction gains the hearers and attention of the audience, and gives a general notion of the subject.

The deſign of this is to prepare the minds of the hearers for a ſuitable reception of the remaining parts that are to follow. And for this end, three things are requiſite; that the orator gain the *good opinion* of his hearers, that he ſecure their *attention*, and give them ſome *general notion* of his ſubject.

1. *Good opinion.* When the orator introduces his

diſcourſe with his own perſon, he will be careful to do it with modeſty, and ſeem rather to extenuate his virtues and abilities, than to magnify them. And where the nature of the ſubject may ſeem to require it, he will endeavour to ſhow, that ſome juſt and good reaſon induced him to engage in it. We have a very fine example of this in Cicero's oration for the poet Aulus Licinius Archias, which begins thus: "If I have any natural genius, which I am ſenſible is very ſmall, or any ability in ſpeaking, wherein I own I have been very converſant; or any ſkill acquired from the ſtudy and precepts of the beſt arts, to which my whole life has been devoted; this Aulus Licinius has, in a particular manner, a right to demand of me the fruit of all theſe things. For as far back as I can remember, and call to mind what paſſed in my youth to the preſent time, he has been my chief adviſer and encourager both to undertake and purſue this courſe of ſtudies." When the orator ſets out with the perſons of thoſe to whom the diſcourſe is made, it is not unuſual to commend them for their virtues, and thoſe eſpecially which have a more immediate relation to the preſent ſubject. Thus Cicero begins his oration of thanks for the pardon of Marcellus, with an encomium upon the mildneſs, clemency, and wiſdom of Cæſar, to whom it was addreſſed. But ſometimes the orator expreſſes his gratitude for paſt favours; as Cicero has done in his orations, both to the people and ſenate of Rome, after his return from baniſhment.—And at other times he declares his concern for them and their intereſt; in which manner Cicero begins his fourth oration againſt Catiline, which was made in the ſenate." "I perceive (ſays he) that all your countenances and eyes are turned on me; I perceive that you are ſolicitous, not only for your own danger, and that of the ſtate, but for mine likewiſe, if that ſhould be removed. Your affection for me is pleaſant in misfortunes, and grateful in ſorrow; but I adjure you to lay it aſide, and, forgetting my ſafety, conſider yourſelves and your children." But in judicial caſes, both the character of the perſon whoſe cauſe he eſpouſes, and that of the adverſe party likewiſe, furniſh the orator with arguments for exciting the good will of his hearers: The former, by commemorating his virtues, dignity, or merits, and ſometimes his misfortunes and calamities. So Cicero, in his defence of Flaccus, begins his oration in commending him on the account of his ſervices done to the public, the dignity of his family, and his love to his country. And Demoſthenes, in his oration againſt Midias, ſets out with a recital of his vices, in order to recommend his own cauſe to the favourable opinion of the court.

2. *Attention.* On this head, Cicero ſays, "We ſhall be heard attentively on one of theſe three things; if we propoſe what is great, neceſſary, or for the intereſt of thoſe to whom the diſcourſe is addreſſed." So that, according to him, the topics of attention are much the ſame with thoſe of good opinion, when taken from the ſubject. And indeed, people are naturally led to attend either to thoſe things or perſons of which they have entertained a favourable opinion. But in order to gain this point, the orator ſometimes thinks it proper to requeſt the attention of his audience. Thus Cicero, in his defence of Cluentius, after having ſhown the heinouſneſs of the charge againſt him, concludes his introduction in the following manner, ſpeaking to the judges: "Wherefore I entreat, that while I briefly and clearly reply to a charge of many years ſtanding, you will, according to your uſual cuſtom, give me a kind and attentive hearing." And again, in his ſecond Philippic, addreſſing himſelf to the ſenate: "But as I muſt ſay ſomething for myſelf, and many things againſt Mark Antony; one of theſe I beg of you, that you will hear me kindly, while I ſpeak for myſelf; and the other I will undertake for, that when I ſpeak againſt him, you ſhall hear me with attention." But though the introduction be the moſt uſual and proper place for gaining attention, yet the orator finds it convenient ſometimes to quicken and excite his hearers in other parts of his diſcourſe, when he obſerves they flag, or has ſomething of moment to offer.

3. Some *general account* of the ſubject of the diſcourſe. This is always neceſſary; which the two others are not. And therefore it muſt be left to the prudence of the orator when to uſe or omit them as he ſhall judge proper, from the nature of his diſcourſe, the circumſtance of his hearers, and how he ſtands with them. But ſome account of the ſubject is what cannot be neglected. For every one expects to be ſoon informed of the deſign of the ſpeaker, and what he propoſes to treat of. Nor when they are all made uſe of, it is neceſſary they ſhould always ſtand in the order we have here placed them. Cicero ſometimes enters immediately upon his ſubject, and introduces the other heads afterwards. As in his third oration againſt Catiline, made to the body of the Roman people, which begins thus: "You ſee that the ſtate, all your lives, eſtates, fortunes, wives and children, and this ſeat of the greateſt empire, the moſt flouriſhing and beautiful city, having by the favour of heaven towards you, and my labours, counſels, and dangers, been this day reſcued from fire and ſword, the very jaws of deſtruction, are preſerved and reſt[illegible] to you." And then he proceeds to recommend [illegible]ſelf to their eſteem and benevolence, from the commemoration of theſe benefits.

These are the heads which commonly furniſh matter for this part of a diſcourſe. But orators often take occaſion from the time, place, largeneſs of the aſſembly, or ſome other proper circumſtance, to compliment their hearers, recommend themſelves, or introduce the ſubject upon which they are about to treat. Inſtances of each of theſe may be met with in ſeveral of Cicero's orations. And ſometimes they ſet out with ſome compariſon, ſimilitude, or other ornament, which they accommodate to the occaſion of their diſcourſe. Thus Iſocrates enters upon his celebrated panegyric in praiſe of his countrymen the Athenians with the following compariſon: "I have often wondered what could be their deſign who brought together theſe aſſemblies, and inſtituted the gymnaſtic ſports, to propoſe ſo great rewards for bodily ſtrength; and to vouchſafe no honour to thoſe who applied their private labours to ſerve the public, and ſo cultivated their minds as to be ſerviceable to others, to whom they ought to have ſhown greater regard. For although the ſtrength of a champion was doubled, no benefit would from thence accrue to others; but all enjoy the prudence of one man, who will hearken to his advice." In ſome caſes, orators

As introduction is not confined to thoſe heads, but can admit of other matter, if furniſhed by the circumſtances of the caſe.

Diſpoſition.

orators have recourſe to a more covert and artful way of opening their ſubject, endeavour to remove jealouſies, apologize for what they are about to ſay, and ſeem to refer it to the candour of the hearers to judge of it as they pleaſe. Cicero appears to have been a perfect maſter of this art, and uſed it with great ſucceſs. Thus in his ſeventh Philippic, where he ſeems to expreſs the greateſt concern, leſt what he was about to ſay ſhould give any offence to the ſenate to whom he was ſpeaking: "I (ſays he) who always declared for peace, and to whom peace among ourſelves, as it is wiſhed for by all good men, was in a particular manner deſirable; who have employed all my induſtry in the forum, in the ſenate, and in the defence of my friends, whence I have arrived to the higheſt honours, a moderate fortune, and what reputation I enjoy; I therefore, who owe what I am to peace, and without it could not have been the perſon I am, be that what it will, for I would arrogate nothing to myſelf; I ſpeak with concern and fear, how you will receive what I am going to ſay; but I beg and entreat you, from the great regard I have always expreſſed for the ſupport and advancement of your honour, that if any thing ſaid by me ſhould at firſt appear harſh or unfit to be received, you will notwithſtanding pleaſe to hear it without offence, and not reject it till I have explained myſelf: I then, for I muſt repeat it again, who have always approved of peace, and promoted it, am againſt a peace with Mark Antony." This is called *inſinuation;* and may be neceſſary, where a cauſe is in itſelf doubtful, or may be thought ſo from the received notions of the hearers, or the impreſſions already made upon them by the contrary ſide. An honeſt man would not knowingly engage in a bad cauſe; and yet, through prevailing prejudice, that may be ſo eſteemed which is not ſo in itſelf. In theſe caſes, therefore, great caution and prudence are neceſſary to give ſuch a turn to things, and place them in that view as may be leaſt liable to offence. And becauſe it ſometimes happens that the hearers are not ſo much diſpleaſed at the ſubject as the perſon, Quintilian's rule ſeems very proper, when he ſays, "If the ſubject diſpleaſes, the character of the perſon ſhould ſupport it; and when the perſon gives offence, he ſhould be helped by the cauſe."

CHAP. II. *Of Narration.*

26
Narration brings forward all thoſe circumſtances of a caſe, &c. in their proper and natural order, which are calculated to ſet it in a juſt or a ſtrong light.

THE orator having prepared his hearers to receive his diſcourſes with candour and attention, and acquainted them with his general deſign in the introduction, before he proceeds directly to his ſubject, often finds it neceſſary to give ſome account of what preceded, accompanied, or followed upon it. And this he does in order to enlarge the view of the particular point in diſpute, and place it in a clearer light. This is called *narration;* which is a recital of ſomething done, in the order and manner in which it was done. Hence it is eaſy to perceive what thoſe things are which properly enter into a narration. And ſuch are the cauſe, manner, time, place, and conſequences of an action; with the temper, fortune, views, ability, aſſociates, and other circumſtances of thoſe concerned in it. Not that each of theſe particulars is neceſſary in every narration: but ſo many of them at leaſt as are requiſite to ſet the matter in a juſt light, and make it appear credible. Beſides, in relating a fact, the orator does not content himſelf with ſuch an account of it as is barely ſufficient to render what he ſays intelligible to his hearers; but deſcribes it in ſo ſtrong and lively a manner, as may give the greateſt evidence to his relation, and make the deepeſt impreſſion upon their minds. And if any part of it appears at preſent leſs probable, he promiſes to clear up and remove any remaining doubts in the progreſs of his diſcourſe. For the foundation of his reaſoning afterwards is laid in the narration, from whence he takes his arguments for the confirmation. And therefore it is a matter of no ſmall importance that this part be well managed, ſince the ſucceſs of the whole diſcourſe ſo much depends upon it. See NARRATION.

There are four properties required in a good narration; that it be ſhort, clear, probable, and pleaſant.

1. The *brevity* of a narration is not to be judged of barely from its length: for that may be too long, which contains but a little; and that too ſhort, which comprehends a great deal. Wherefore this depends upon the nature of the ſubject, ſince ſome things require more words to give a juſt repreſentation of them, and others fewer. That may properly therefore be called a *ſhort narration,* which contains nothing that could well have been omitted, nor omits any thing which was neceſſary to be ſaid. Now, in order to avoid both theſe extremes, care ſhould be taken not to go farther back in the account of things, nor to trace them down lower, than the ſubject requires; to ſay that only in the general, which does not need a more particular explication; not to aſſign the cauſes of things, when it is enough to ſhow they were done; and to omit ſuch things as are ſufficiently underſtood, from what either preceded, or was conſequent upon them. But the orator ſhould be careful, leſt, while he endeavours to avoid prolixity, he run into obſcurity. Horace was very ſenſible of this danger, when he ſaid,

> By ſtriving to be ſhort, I grow obſcure.

2. *Perſpicuity.* This may juſtly be eſteemed the chief excellency of language. For as the deſign of ſpeech is to communicate our thoughts to others, that muſt be its greateſt excellence which contributes moſt to this end; and that, doubtleſs, is perſpicuity. As perſpicuity therefore is requiſite in all diſcourſe, ſo it is particularly ſerviceable in a narration, which contains the ſubſtance of all that is to be ſaid afterwards. Wherefore, if this be not ſufficiently underſtood, much leſs can thoſe things which receive their light from it. Now the following things render a narration clear and plain: Proper and ſignificant words, whoſe meaning is well known and determined; ſhort ſentences, though full and explicit, whoſe parts are not perplexed, but placed in their juſt order; proper particles to join the ſentences, and ſhow their connexion and dependence on each other; a due regard to the order of time, and other circumſtances neceſſary to be expreſſed; and, laſtly, ſuitable tranſitions.

3. *Probability.* Things appear probable when the cauſes aſſigned for them appear natural; the manner in which they are deſcribed is eaſy to be conceived; the conſequences are ſuch as might be expected; the characters of the perſons are juſtly repreſented;

and the whole account is well atteſted, conſiſtent with itſelf, and agreeable to the general opinion. Simplicity likewiſe in the manner of relating a fact, as well as in the ſtyle, without any reſerve or appearance of art, contributes very much to its credibility. For truth loves to appear naked and open, ſtript of all colouring or diſguiſe. The conſpiracy of Catiline was ſo daring and extravagant, that no one but ſuch a deſperado could ever have undertaken it with any hopes of ſucceſs. However, Cicero's account of it to the ſenate was ſo full and exact, and ſo well ſuited to the character of the perſon, that it preſently gained credit. And therefore, when, upon the concluſion of Cicero's ſpeech, Catiline, who was preſent, immediately ſtood up, and deſired they would not entertain ſuch hard thoughts of him, but conſider how much his family had always been attached to the public intereſt, and the great ſervices they had done the ſtate; their reſentment roſe ſo high, that he could not be heard: upon which he immediately left the city, and went to his aſſociates.

4. The laſt thing required in a narration is, that it be *pleaſant* and *entertaining*. And this is more difficult, becauſe it does not admit of that accurate compoſition and pompous dreſs which delight the ear, and recommend ſome other parts of a diſcourſe. For it certainly requires no ſmall ſkill in the ſpeaker, while he endeavours to expreſs every thing in the moſt natural, plain, and eaſy manner, not to grow flat and tireſome. For Quintilian's remark is very juſt, that "the moſt experienced orators find nothing in eloquence more difficult, than what all who hear it fancy they could have ſaid themſelves." And the reaſon of this ſeems very obvious. For as all art is an imitation of nature, the nearer it reſembles that, the more perfect it is in its kind. Hence unexperienced perſons often imagine that to be eaſieſt which ſuits beſt with thoſe natural ideas to which they have been accuſtomed; till, upon trial, they are convinced of their miſtake. Wherefore, to render this part of a diſcourſe pleaſant and agreeable, recourſe muſt be had to variety both in the choice of words and turns of the expreſſion. And therefore queſtions, admirations, interlocutions, imagery, and other familiar figures, help very much to diverſify and enliven a narration, and prevent it from becoming dull and tedious, eſpecially when it is carried on to any conſiderable length.

27 The uſes of narration. Having given a brief account of the nature and properties of a narration, we ſhall now proceed to conſider the uſes of it.

Laudatory orations are uſually as it were a ſort of continued narration, ſet off and adorned with florid language and fine images proper to grace the ſubject, which is naturally ſo well fitted to afford pleaſure and entertainment. Wherefore a ſeparate narration is more ſuited to *deliberative* and *judicial* diſcourſes. In Cicero's oration for the Manilian law (which is of the former kind), the deſign of the narration is to ſhow the Roman people the neceſſity of giving Pompey the command of the army againſt King Mithridates, by repreſenting the nature of that war, which is done in the following manner: "A great and dangerous war (ſays he) threatens your revenues and allies from two very powerful kings, Mithridates and Tigranes; one of whom not being purſued after his defeat, and the other provoked, they think they have an opportunity to ſeize Aſia. Letters are daily brought from thoſe parts to worthy gentlemen of the equeſtrian order, who have large concerns there in farming your revenues: they acquaint me, as friends, with the ſtate of the public affairs, and danger of their own; that many villages in Bithynia, which is now your province, are burnt down; that the kingdom of Ariobarzanes, which borders upon your revenues, is entirely in the enemy's power; that Lucullus, after ſeveral great victories, is withdrawn from the war; that he who ſucceeds him is not able to manage it; that all the allies and Roman citizens wiſh and deſire the command of that war may be given to one particular perſon; and that he alone, and no other, is dreaded by the enemies. You ſee the ſtate of the caſe; now conſider what ought to be done." Here is an unhappy ſcene of affairs, which ſeemed to call for immediate redreſs. The cauſes and and reaſons of it are aſſigned in a very probable manner, and the account well atteſted by perſons of character and figure. And what the conſequences would be, if not timely prevented, no one could well be ignorant. The only probable remedy ſuggeſted in general is, the committing that affair to one certain perſon, which he afterwards ſhows at large could be no other than Pompey. But in Cicero's defence of Milo (which is of the *judicial* kind), the deſign of the narration, which is greatly commended by Quintilian, is to prove that, in the combat between Clodius and Milo, the former was the aggreſſor. And in order to make this appear, he gives a ſummary account of the conduct of Clodius the preceding year; and from the courſe of his actions and behaviour, ſhows the inveterate hatred he bore to Milo, who obſtructed him in his wicked deſigns. For which cauſe he had often threatened to kill him, and given out that he ſhould not live beyond ſuch a time: and accordingly he went from Rome without any other apparent reaſon, but that he might have an opportunity to attack him in a convenient place near his own houſe, by which he knew Milo was then obliged to paſs. Milo was in the ſenate that day, where he ſtaid till they broke up, then went home, and afterwards ſet forward on his journey. When he came to the place in which he was to be aſſaulted, Clodius appeared every way prepared for ſuch a deſign, being on horſeback, and attended with a company of deſperate ruffians ready to execute his commands; whereas Milo was with his wife in a chariot, wrapped up in his cloak, and attended with ſervants of both ſexes. Theſe were all circumſtances which preceded the fact. And as to the action itſelf, with the event of it, the attack, as Cicero ſays, was begun by the attendants of Clodius from a higher ground, who killed Milo's coachman; upon which Milo, throwing off his cloak, leaped out, and made a brave defence againſt Clodius's men, who were got about the chariot. But Clodius, in the heat of the ſkirmiſh, giving out that Milo was killed, was himſelf ſlain by the ſervants of Milo, to avenge, as they thought, the death of their maſter. Here ſeems to be all the requiſites proper to make this account credible. Clodius's open and avowed hatred of Milo, which proceeded ſo far as to threaten his life; the time of his leaving Rome; the convenience of the place; his habit and company ſo different from thoſe of Milo; joined with his known character of a moſt profligate and audacious wretch, could not but render it very probable that he had formed that deſign to kill Milo. And which of them began the attack might very reaſonably be credited from the advanced ground on which Clodius and his men were placed; the death of Milo's coachman at the beginning of the combat; the ſkirmiſh afterwards at the chariot; and the reaſon of Clodius's own death at laſt, which does not appear to have been intended, till he had given out that Milo was killed.

But a diſtinct and ſeparate narration is not always neceſſary in any kind of diſcourſe. For if the matter be well known before, a ſet and formal narrative will be tedious to the hearers. Or if one party has done it already, it is needleſs for the other to repeat it. But there are three occaſions eſpecially, in which it may ſeem very requiſite: when it will bring light to the ſubject; when different accounts have already been given out concerning it; or when it has been miſrepreſented by the adverſe party. If the point in controverſy be of a dubious nature, or not ſufficiently known to the hearers, a diſtinct account of the matter, with the particular circumſtances attending it, muſt be very ſerviceable, in order to let them into a true ſtate of the caſe, and enable them to judge of it with greater certainty.

Moreover, where the oppoſite party has ſet the matter in a falſe light by ſome artful and invidious turn, or loaded it with any odious circumſtances, it ſeems no leſs neceſſary that endeavours ſhould be uſed to remove any ill impreſſions, which otherwiſe might remain upon the minds of the hearers, by a different and more favourable repreſentation. And if any thing can be fixed upon to make the contrary account appear abſurd or incredible, it ought particularly to be remarked. Thus Cicero, in his defence of Sextus Roſcius, ſhows that he was many miles diſtant from Rome at the time he was charged with having killed his father there. "Now (ſays he), while Sextus Roſcius was at Ameria, and this Titus Roſcius [*his accuſer*] at Rome, Sextus Roſcius [*the father*] was killed at the baths on Mount Palatine, returning from ſupper. From whence I hope there can be no doubt who ought to be ſuſpected of the murder. And, were not the thing plain of itſelf, there is this farther ſuſpicion to fix it upon the proſecutor; that, after the fact was committed, one Mallius Glaucia, an obſcure fellow, the freedman, client, and familiar, of this Titus Roſcius, firſt carried the account of it to Ameria, not to the ſon of the deceaſed, but to the houſe of Titus Capito his enemy;" with more to the ſame purpoſe. But what we bring it for is, to ſhow the uſe which Cicero makes of this narration for retorting the crime upon the proſecutors.

But the orator ſhould be very careful, in conducting this part, to avoid every thing which may prejudice the cauſe he eſpouſes. Falſehood, and a miſrepreſentation of facts, are not to be juſtified; but no one is obliged to ſay thoſe things which may hurt himſelf. We ſhall juſt mention one inſtance of this from Cicero, where he has ſhown great ſkill in this reſpect, in pleading before Cæſar for the pardon of Ligarius, who had joined with Pompey in the civil war. For Ligarius, having been repreſented by the adverſe party as an enemy to Cæſar, and ſo eſteemed by Cæſar himſelf; Cicero very artfully endeavours in his narration to take off the force of this charge, by ſhowing, that, when the war firſt broke out, he refuſed to engage in it; which he would not have done, had he borne any perſonal hatred to Cæſar. "Quintus Ligarius (ſays he), before there was any ſuſpicion of a war, went into Africa as a legate to the proconſul Caius Confidius; in which he ſo approved himſelf, both to the Roman citizens and allies, that, when Confidius left the province, the inhabitants would not be ſatisfied he ſhould leave the government in the hands of any other perſon. Therefore Quintus Ligarius having excuſed himſelf in vain for ſome time, accepted of the government againſt his will; which he ſo managed during the peace, that both the citizens and allies were greatly pleaſed with his integrity and juſtice. The war broke out on a ſudden, which thoſe in Africa did not hear of till it was begun: but upon the news of it, partly through inconſiderate haſte, and partly from blind fear, they looked out for a leader, firſt for their own ſafety, and then as they were affected; when Ligarius, thinking of home, and deſirous to return to his friends, would not be prevailed on to engage in any affairs. In the mean time, Publius Accius Varus, the prætor, who was formerly governor of Africa, coming to Utica, recourſe was immediately had to him, who very eagerly took upon himſelf the government; if that can be called a *government*, which was conferred on a private man by the clamour of the ignorant multitude, without any public authority. Ligarius, therefore, who endeavoured to avoid every thing of that kind, ceaſed to act ſoon after the arrival of Varus." Here Cicero ends his narrative. For though Ligarius afterwards joined with Pompey's party, yet to have mentioned that, which was nothing more than what many others had done, whom Cæſar had already pardoned, could have ſerved only to increaſe his diſpleaſure againſt him. And therefore he doubtleſs ſhowed great ſkill in ſo managing his account, as to take off the main force of the accuſation, and by that means make way for his pardon, which he accordingly obtained.

Chap. III. *Of the Propoſition.*

28 The propoſition is a diſtinct and expreſs manner of laying down the ſubject on which an orator means to treat.

In every juſt and regular diſcourſe, the ſpeaker's intention is to prove or illuſtrate ſomething. And when he lays down the ſubject upon which he deſigns to treat, in a diſtinct and expreſs manner, this is called the *propoſition*.

Orators uſe ſeveral ways in laying down the ſubject of their diſcourſes. Sometimes they do it in one general propoſition. We have an inſtance of this in Cicero's ſpeech to the ſenate, the day after Cæſar was killed (as it is given us by Dion Caſſius), in which his deſign was to perſuade them to peace and unanimity. "This (ſays he) being the ſtate of our affairs, I think it neceſſary that we lay aſide all the diſcord and enmity which have been among us, and return again to our former peace and agreement." And then he proceeds to offer his reaſons for this advice.

At other times, to give a clearer and more diſtinct view of their diſcourſe, they ſubjoin to the propoſition the general heads of argument by which they endeavour to ſupport it. This method Cicero uſes in his ſeventh Philippic, where he ſays, "I who have always commended and adviſed to peace, am againſt a peace with Mark Antony. But why am I averſe to peace? Becauſe it is baſe, becauſe it is dangerous, and becauſe it is impracticable. And I beſeech you to hear me with your uſual candour, while I make out theſe three things."

29
When the ſubject refers to ſeveral different things, and requires to be laid down in diſtinct propoſitions, it is called a *partition.*

But when the ſubject relates to ſeveral different things, which require each of them to be ſeparately laid down in diſtinct propoſitions, it is called a *partition*; though ſome have made two kinds of *partition*, one of which they call *ſeparation*, and the other *enumeration*. By the former of theſe, the orator ſhows in what he agrees with his adverſary, and wherein he differs from him. So, in the caſe formerly mentioned, of a perſon accuſed of ſacrilege for ſtealing private money out of a temple, he who pleads for the defendant ſays, "He owns the fact; but it being private money, the point in queſtion is, Whether this be ſacrilege?" And in the cauſe of Milo, Cicero ſpeaking of Clodius, ſays, "The point which now comes before the court, is not, Whether he was killed or not; that we confeſs: but, Whether juſtly or unjuſtly." Now in reality here is no partition, ſince the former branch of the propoſition is what is agreed upon, and given up; and conſequently it is only the latter that remains to be diſputed. It is called *enumeration*, when the orator acquaints his hearers with the ſeveral parts of his diſcourſe upon which he deſigns to treat. And this alone, properly ſpeaking, is a *partition*. Thus Cicero ſtates his plea in his defence of Muræna: "I perceive the accuſation conſiſts of three parts: the firſt reſpects the conduct of his life; the ſecond his dignity; and the third contains a charge of bribery."

There are three things requiſite in a good partition; that it be *ſhort, complete*, and conſiſt but of a *few members*.

A partition is ſaid to be *ſhort*, when each propoſition contains in it nothing more than what is neceſſary. So that the brevity here required is different from that of a narration; for that conſiſts chiefly in things, this in words. And, as Quintilian juſtly obſerves, brevity ſeems very proper here, where the orator does not ſhow what he is then ſpeaking of, but what he deſigns to diſcourſe upon.

Again, It ought to be *complete* and perfect. And for this end, care muſt be taken to omit no neceſſary part in the enumeration.

But, however, there ſhould be as *few heads* as is conſiſtent with the nature of the ſubject. The ancient rhetoricians preſcribe three or four at the moſt. And we do not remember that Cicero ever exceeds that number. But it is certain, the fewer they are, the better, provided nothing neceſſary be omitted. For too large a number is both difficult of retention, and apt to introduce that confuſion which partition is deſigned to prevent.

Hitherto we have been ſpeaking only of thoſe heads into which the ſubject or general argument of the diſcourſe is at firſt divided. For it is ſometimes convenient to divide theſe again, or at leaſt ſome of them, into ſeveral parts or members. And when this happens, it is beſt done, as the ſpeaker comes to each of them in the order at firſt laid down; by which means the memory of the hearers will be leſs burdened than by a multitude of particulars at one and the ſame time. Thus Cicero, in his oration for the Manilian law, compriſes what he deſigns to ſay under three general heads. "Firſt (ſays he) I ſhall ſpeak of the nature of the war, then of its greatneſs, and laſtly about the choice of a general." And when he comes to the firſt of theſe, he divides it again into four branches; and ſhows, "how much the glory of the Romans, the ſafety of their allies, their greateſt revenues, and the fortunes of many of their citizens, were all concerned in that war." The ſecond head, in which he conſiders the greatneſs of the war, has no diviſion. But when he comes to the third head, concerning the choice of a general, he divides that likewiſe into four parts; and ſhows, that ſo many virtues are neceſſary in a conſummate general, ſuch a one as was proper to have the management of that war, namely, *ſkill in military affairs, courage, authority*, and *ſucceſs*: all which he attributes to Pompey. And this is the ſcheme of that celebrated oration.

This ſubdividing, however, ſhould never have place but when it is abſolutely neceſſary. To ſplit a ſubject into a great many minute parts, by diviſions and ſubdiviſions without end, has always a bad effect in ſpeaking. It may be proper in a logical treatiſe; but it makes an oration appear hard and dry, and unneceſſarily fatigues the memory. In a ſermon, there may be three to five, or ſix heads, including ſubdiviſions; ſeldom ſhould there be more.

30
Negative and poſitive diviſions of a ſubject.

Further, Some divide their ſubject into two parts, and propoſe to treat upon it *negatively* and *poſitively*; by ſhowing firſt what it is not, and then what it is. But while they are employed to prove what it is not, they are not properly treating upon that, but ſomething elſe; which ſeems as irregular as it is unneceſſary. For he who proves what a thing is, does at the ſame time ſhow what it is not. However, in fact, there is a ſort of diviſion by affirmation and negation, which may ſometimes be conveniently uſed. As if a perſon, charged with killing another, ſhould thus ſtate his defence: *I had done right if I had killed him, but I did not kill him.* Here indeed, if the latter can be plainly made to appear, it may ſeem needleſs to inſiſt upon the former. But if that cannot be ſo fully proved, but there may be room left for ſuſpicion, it may be proper to make uſe of both: for all perſons do not ſee things in the ſame light, and he who believes the fact, may likewiſe think it juſt; while he who thinks it unjuſt, may not believe it, but rather ſuppoſe, had it really been committed by the party, he would not have denied it, ſince he looked upon it as defenſible. And this method of proceeding, Quintilian compares to a cuſtom often uſed in traffic, when perſons make a large demand at firſt, in order to gain a reaſonable price. Cicero uſes this way of reaſoning in his defence of Milo; but in the contrary order; that is, he firſt anſwers the charge; and then juſtifies the fact, upon the ſuppoſition that the charge was true. For he proves, firſt, that Clodius was the aggreſſor; and not Milo, as the contrary party had aſſerted: and then, to give the greater advantage to his cauſe, he proceeds to ſhow, that if Milo had been the aggreſſor, it would however have been a glorious action

tion to take off ſuch an abandoned wretch, who was not only a common enemy to mankind, but had likewiſe often threatened his liſe.

A good and juſt partition is attended with conſiderable advantages. For it gives both light and ornament to a diſcourſe. And it is alſo a great relief to the hearers, who, by means of theſe ſtops and reſts, are much better enabled to keep pace with the ſpeaker without confuſion, and by caſting their thoughts either way, from what has been ſaid, both know and are prepared for what is to follow. And as perſons, in travelling a road with which they are acquainted, go on with greater pleaſure and leſs fatigue, becauſe they know how far it is to their journey's end; ſo to be appriſed of the ſpeaker's deſign, and the ſeveral parts of his diſcourſe which he propoſes to treat on, contributes very much to relieve the hearer, and keep up his attention. This muſt appear very evident to all who conſider how difficult it is to attend long and cloſely to one thing, eſpecially when we do not know how long it may be before we are like to be releaſed. Whereas, when we are beforehand acquainted with the ſcheme, and the ſpeaker proceeds regularly from one thing to another, opportunity is given to eaſe the mind, by relaxing the attention, and recalling it again when neceſſary. In a ſermon, or in a pleading at the bar, few things are of greater conſequence than a proper or happy diviſion. It ſhould be ſtudied with much accuracy and care; for if one take a wrong method at firſt ſetting out, it will lead him aſtray in all that follows. It will render the whole diſcourſe either perplexed or languid; and though the hearers may not be able to tell where the fault or diſorder lies, they will be ſenſible there is a diſorder ſomewhere, and find themſelves little affected by what is ſpoken. The French writers of ſermons ſtudy neatneſs and elegance in the diviſion of their ſubjects much more than the Engliſh do; whoſe diſtributions, though ſenſible and juſt, yet are often inartificial and verboſe.

CHAP. IV. *Of Confirmation.*

31 Confirmation is uſed for the arguments brought in defence of a ſubject.

The orator having acquainted his hearers, in the propoſition, with the ſubject on which he deſigns to diſcourſe, uſually proceeds either to prove or illuſtrate what he has there laid down. For ſome diſcourſes require nothing more than an enlargement or illuſtration, to ſet them in a proper light, and recommend them to the hearers; for which reaſon, likewiſe, they have often no diſtinct propoſition. But where arguments are brought in defence of the ſubject, this is properly *confirmation*. For, as Cicero defines it, "confirmation is that which gives proof, authority, and ſupport to a cauſe, by reaſoning." And for this end, if any thing in the propoſition ſeems obſcure, or liable to be miſunderſtood, the orator firſt takes care to explain it, and then goes on to offer ſuch arguments for the proof of it, and repreſent them in ſuch a light, as may be moſt proper to gain the aſſent of his hearers.

But here it is proper to obſerve, that there are different ways of reaſoning ſuited to different arts. The mathematician treats his ſubject after another manner than the logician, and the orator in a method different from them both. Two methods of reaſoning are employed by orators, the *ſynthetic* and *analytic*.

32 Synthetic reaſoning may always be reſolved into a ſyllogiſm or ſeries of ſyllogiſms.

I. Every piece of ſynthetic reaſoning may be reſolved into a ſyllogiſm or ſeries of ſyllogiſms, (ſee LOGIC.) Thus we may reduce Cicero's argument, by which he endeavours to prove that Clodius aſſaulted Milo, and not Milo Clodius, to a ſyllogiſm in this manner:

He was the aggreſſor, whoſe advantage it was to kill the other.
But it was the advantage of Clodius to kill Milo, and not Milo to kill him.
Therefore Clodius was the aggreſſor, or he aſſaulted Milo.

The thing to be proved was, that Clodius aſſaulted Milo, which therefore comes in the concluſion: and the argument, by which it is proved, is taken from the head of profit or advantage. Thus the logician would treat this argument; and if either of the premiſes were queſtioned, he would ſupport it with another ſyllogiſm. But this ſhort and dry way of reaſoning does not at all ſuit the orator: who not only for variety changes the order of the parts, beginning ſometimes with the minor, and at other times with the concluſion, and ending with the major; but likewiſe clothes each part with ſuch ornaments of expreſſion as are proper to enliven the ſubject, and render it more agreeable and entertaining. And he frequently ſubjoins, either to the major propoſition, or minor, and ſometimes to both, one or more arguments to ſupport them; and perhaps others to confirm or illuſtrate them as he thinks it requiſite. Therefore, as a logical ſyllogiſm conſiſts of three parts or propoſitions, a rhetorical ſyllogiſm frequently contains four, and many times five parts. And Cicero reckons this laſt the moſt complete. But all that is ſaid in confirmation of either of the premiſes is accounted but as one part. This will appear more evident by examples: By a ſhort ſyllogiſm Cicero thus proves, that the Carthaginians were not to be truſted: "Thoſe who have often deceived us, by violating their engagements, ought not to be truſted. For if we receive any damage by their treachery, we can blame nobody but ourſelves. But the Carthaginians have often ſo deceived us. Therefore it is madneſs to truſt them." Here the major propoſition is ſupported by a reaſon. The minor needed none; becauſe the treachery of the Carthaginians was well known. So that this ſyllogiſm conſiſts of four parts. But by a ſyllogiſm of five parts he proves ſomewhat more largely and elegantly, that the world is under the direction of a wiſe governor. The major is this: "Thoſe things are better governed which are under the direction of wiſdom, than thoſe which are not." This he proves by ſeveral inſtances: "A houſe managed with prudence has every thing in better order, and more convenient, than that which is under no regulation. An army commanded by a wiſe and ſkilful general is in all reſpects better governed than one which has a fool or a madman at the head of it. And the like is to be ſaid of a ſhip, which performs her courſe beſt under the direction of a ſkillful pilot." Then he proceeds to the minor thus: "But nothing is better governed than the univerſe."

Which he proves in this manner: "The riſing and ſetting of the heavenly bodies keep a certain determined order; and the ſeveral ſeaſons of the year do not only neceſſarily return in the ſame manner, but are ſuited to the advantage of the whole; nor did the viciſſitudes of night and day ever yet become prejudicial, by altering their courſe." From all which he concludes, "That the world muſt be under the direction of a wiſe governor." In both theſe examples, the regular order of the parts is obſerved. We ſhall therefore produce another, in which the order is directly contrary; for beginning with the concluſion, he proceeds next to the minor propoſition, and ſo ends with the major. In his defence of Cœlius, his deſign is to prove that Cœlius had not led a looſe and vicious life, with which his enemies had charged him. And this he does, by ſhowing he had cloſely followed his ſtudies, and was a good orator. This may probably at firſt ſight appear but a weak argument; though to him who conſiders what Cicero everywhere declares neceſſary to gain that character, it may perhaps be thought otherwiſe. The ſenſe of what he ſays here may be reduced to this ſyllogiſm.

Thoſe who have purſued the ſtudy of oratory, ſo as to excel in it, cannot have led a looſe and vicious life.
But Cœlius has done this.
Therefore his enemies charge him wrongfully.

But let us hear Cicero himſelf. He begins with the concluſion, thus: "Cœlius is not chargeable with profuſeneſs, extravagancy, contracting of debts, or intemperance, a vice which age is ſo far from abating, that it rather increaſes it. Nay, he never engaged in amours, and thoſe pleaſures of youth, as they are called, which are ſoon thrown off, as reaſon prevails." Then he proceeds to the minor, and ſhows from the effects, that Cœlius had cloſely applied himſelf to the beſt arts, by which he means thoſe neceſſary for an orator: "You have now heard him make his own defence, and you formerly heard him engaged in a proſecution (I ſpeak this to vindicate, not to applaud him), you could not but perceive his manner of ſpeaking, his ability, his good ſenſe, and command of language. Nor did he only diſcover a good genius, which will oftentimes do much of itſelf when it is not improved by induſtry; but what he ſaid (if my affection for him did not bias my judgment) appeared to be the effect of learning, application, and ſtudy." And then he comes to the major: "But be aſſured, that thoſe vices charged upon Cœlius, and the ſtudies upon which I am now diſcourſing, cannot meet in the ſame perſon. For it is not poſſible that a mind, diſturbed by ſuch irregular paſſions, ſhould be able to go through what we orators do, I do not mean only in ſpeaking, but even in thinking." And this he proves by an argument taken from the ſcarcity of good orators. "Can any other reaſon be aſſigned, why ſo few, both now, and at all times, have engaged in this province, when the rewards of eloquence are ſo magnificent, and it is attended with ſo great delight, applauſe, glory, and honour? All pleaſures muſt be neglected; diverſions, recreations, and entertainments omitted; and even the converſation of all our friends muſt in a manner be laid aſide. This it is which deters perſons from the labour and ſtudy of oratory; not their want of genius or education."

33
Orators do not often uſe complete ſyllogiſms, but moſt commonly imperfect ones, called enthymems.

2. By *Enthymem.* But orators do not often uſe complete ſyllogiſms, but moſt commonly enthymems. An *enthymem*, as is ſhown elſewhere, is an imperfect ſyllogiſm, conſiſting of two parts; the concluſion, and one of the premiſes. And in this kind of ſyllogiſm, that propoſition is omitted, whether it be the major or minor, which is ſufficiently manifeſt of itſelf, and may eaſily be ſupplied by the hearers. But the propoſition that is expreſſed is uſually called the *antecedent*, and the concluſion the *conſequent*. So if the major of that ſyllogiſm be omitted, by which Cicero endeavours to prove that Clodius aſſaulted Milo, it will make this enthymem:

The death of Milo would have been an advantage to Clodius.
Therefore Clodius was the aggreſſor; or, therefore, he aſſaulted Milo.

In like manner that other ſyllogiſm above-mentioned, by which he ſhows that the Carthaginians ought not to be truſted, by omitting the minor, may be reduced to the following enthymem:

Thoſe who have often broke their faith ought not to be truſted.
For which reaſon the Carthaginians ought not to be truſted.

Every one would readily ſupply the minor, ſince the perfidiouſneſs of the Carthaginians was known to a proverb. But it is reckoned a beauty in enthymems, when they conſiſt of contrary parts: becauſe the turn of them is moſt acute and pungent. Such is that of Micipſa in Salluſt: "What ſtranger will be faithful to you who are an enemy to your friends?" And ſo likewiſe that of Cicero for Milo, ſpeaking of Clodius: "You ſit as avengers of his death; whoſe life you would not reſtore, did you think it in your power." Orators manage enthymems in the ſame manner they do ſyllogiſms; that is, they invert the order of the parts, and confirm the propoſition by one or more reaſons: and therefore a rhetorical enthymem frequently conſiſts of three parts, as a ſyllogiſm does of five. Though, ſtrictly ſpeaking, a ſyllogiſm can conſiſt of no more than three parts, and an enthymem but of two: and the arguments brought to ſupport either of the propoſitions conſtitute ſo many new enthymems, of which the part they are deſigned to prove is the concluſion. To illuſtrate this by an example:

An honeſt man thinks himſelf under the higheſt obligation to his country.
Therefore he ſhould ſhun no danger to ſerve it.

In this *enthymem* the major is wanting, which would run thus: "He who is under the higheſt obligations to another, ſhould ſhun no danger in order to ſerve him." This laſt propoſition is founded upon the common principle of gratitude; which requires that, to the utmoſt of our power, a return ſhould be made in proportion to the kindneſs received. And this being a maxim generally allowed, it is omitted by the orator. But now this enthymem, conſiſting of the minor and concluſion, might be managed in ſome ſuch manner as this, beginning with the concluſion: "An honeſt man ought to ſhun no danger, but readily expoſe his life for the ſafety and preſervation of his country." Then the reaſon of this conduct might be added, which is the antecedent of the enthymem, or minor of the ſyllogiſm: "For he is ſenſible that his obligations to his country are ſo many, and ſo great, that he can never fully requite them." And this again might be confirmed by an enumeration of particulars: "He looks upon himſelf as indebted to his country for every thing he enjoys; for his friends, relations, all the pleaſures of life, and even for life itſelf. Now the orator calls this *one enthymem*, though in reality there are two: For the ſecond reaſon, or argument, added to the firſt, becomes the antecedent of a new enthymem, of which the firſt reaſon is the conſequent. And if theſe two enthymems were expreſſed ſeparately in the natural order of the parts, the former would ſtand thus: "An honeſt man thinks himſelf under the higheſt obligations to his country; therefore he ought to ſhun no danger for its preſervation." The latter thus: "An honeſt man eſteems himſelf indebted to his country for every thing he enjoys; therefore he thinks he is under the higheſt obligations to it." The ſame thing might be proved in the like way of reaſoning, by arguments of a different kind. From compariſon, thus: "As it would be thought baſe and ungrateful in a ſon not to hazard himſelf for the preſervation of his father; an honeſt man muſt certainly eſteem it ſo when his country is in danger." Or from an example, in this manner: "An honeſt man in like circumſtances would propoſe to himſelf the example of Decius, who freely gave up his life for the ſervice of his country. He gave up his life indeed, but did not loſe it; for he cannot be ſaid to have loſt his life, who lives in immortal honour." Orators frequently intermix ſuch arguments to adorn and illuſtrate their ſubject with others taken from the nature and circumſtances of things. And now, if we conſider a little this method of reaſoning, we ſhall find it the moſt plain and eaſy imaginable. For when any propoſition is laid down, and one or more reaſons ſubjoined to prove it, each reaſon joined with the propoſition, makes a diſtinct enthymem, of which the propoſition is the concluſion. Thus Cicero, in his ſeventh Philippic, lays down this as the foundation of his diſcourſe, "That he is againſt a peace with Mark Antony; for which he gives three reaſons: "Becauſe it is baſe, becauſe it is dangerous, and becauſe it is impracticable." Theſe ſeverally joined with the propoſition, form three enthymems; and upon each of theſe he diſcourſes ſeparately, which make up that oration. And this method is what perſons for the moſt part naturally fall into, who know nothing of the terms *ſyllogiſm* or *enthymem*. They advance ſomething, and think of a reaſon to prove it, and another perhaps to ſupport that; and, ſo far as their invention will aſſiſt them, or they are maſters of language, they endeavour to ſet what they ſay in the plaineſt light, give it the beſt dreſs, embelliſh it with proper figures and different turns of expreſſion; and, as they think convenient, illuſtrate it with ſimilitudes, compariſons, and the like ornaments, to render it moſt agreeable, till they think what they have advanced ſufficiently proved. As this method of arguing therefore is the moſt plain, eaſy, and natural; ſo it is what is moſt commonly uſed in oratory. Whereas a ſtrict ſyllogiſtical way of diſcourſing is dry and jejune, cramps the mind, and does not admit of thoſe embelliſhments of language which are a great advantage to the orator: for which reaſon he ſeldom uſes complete ſyllogiſms; and when he does, it is with great latitude. In every diſcourſe care ſhould be taken not to blend arguments confuſedly together that are of a ſeparate nature. "All arguments (ſays the elegant Dr Blair) are directed to prove one or other of theſe three things; that ſomething is true; that it is morally right or fit; or that it is profitable and good. Theſe make the three great ſubjects of diſcuſſion among mankind; truth, duty, and intereſt But the arguments directed towards any one of them are generally diſtinct; and he who blends them all under one topic, which he calls his argument, as, in ſermons eſpecially, is too often done, will render his reaſoning indiſtinct and inelegant. Suppoſe, for inſtance, that I am recommending to an audience benevolence, or the love of our neighbour; and that I take my firſt argument from the inward ſatisfaction which a benevolent temper affords; my ſecond, from the obligation which the example of Chriſt lays upon us to this duty; and third. from its tendency to procure us the good will of all around us; my arguments are good, but I have arranged them wrong: for my firſt and third arguments are taken from conſiderations of intereſt, internal peace, and external advantages; and between theſe, I have introduced one, which reſts wholly upon duty. I ſhould have kept thoſe claſſes of arguments, which are addreſſed to different principles in human nature, ſeparate and diſtinct."

34 The analytic method of reaſoning nearly the ſame with the Socratic.

II. The other method of reaſoning is the analytic, in which the orator conceals his intention concerning the point he is to prove, till he has gradually brought his hearers to the deſigned concluſion. They are led on, ſtep by ſtep, from one known truth to another, till the concluſion be ſtolen from them, as the natural conſequence of a chain of propoſitions. As, for inſtance, when one intending to prove the being of a God, ſets out with obſerving that every thing which we ſee in the world has had a beginning; that whatever has had a beginning, muſt have had a prior cauſe; that in human productions, art ſhown in the effect, neceſſarily infers deſign in the cauſe; and proceeds leading you on from one cauſe to another, till you arrive at one ſupreme firſt cauſe, from whom is derived all the order and deſign viſible in his works. This is much the ſame with the Socratic method, by which that philoſopher ſilenced the ſophiſts of his age.

He proceeded by ſeveral queſtions, which being ſeparately granted, the thing deſigned to be inferred was afterwards put, which, by reaſon of its ſimilitude with ſeveral caſes allowed before, could not be denied. But this is a captious way of reaſoning; for while the reſpondent is not aware of what is deſigned to be inferred, he is eaſily induced to make thoſe conceſſions, which otherwiſe he would not. Beſides, it is not ſo well ſuited to continued diſcourſes, as to thoſe which are interlocutory; and therefore we meet with it ofteneſt in the Socratic dialogues both of Plato and Xenophon. However, it may be made uſe of in oratory by a figure called *ſubjection*, when the ſame perſon firſt puts the queſtion, and then makes the anſwer. So in the famous cauſe of Epaminondas, general of the Thebans, who was accuſed for refuſing to ſurrender his command to his ſucceſſor appointed by the ſtate, till after he had engaged the enemy, and given them a total defeat, Cicero thus repreſents his accuſer pleading for the words of the law againſt Epaminondas, who alleged the intention of it in his defence: "Should Epaminondas add that exception to the law, which, he ſays, was the intention of the writer, namely, *Except any one refuſe to give up his command when it is for the intereſt of the public he ſhould not*; would you admit of it? I believe not. Should you yourſelves, which is a thing moſt remote from your juſtice and wiſdom, in order to ſcreen him, order this exception to be added to the law, without the command of the people; would the Thebans ſuffer it to be done? No certainly. Can it be right then to come into that, as if it was written, which it would be a crime to write? I know it cannot be agreeable to your wiſdom to think ſo."

35 May comprehend reaſoning by *example*.

Under the analytic method may be comprehended reaſoning by *example*. Rhetoricians uſe this word in a different ſenſe from the common acceptation. For that is uſually called an *example*, which is brought either to prove or illuſtrate ſome general aſſertion: As if any one ſhould ſay, that *human bodies may be brought to ſuſtain the greateſt labours by uſe and exerciſe*; and in order to prove this ſhould relate what is ſaid of Milo of Croton, that "by the conſtant practice of carrying a calf ſeveral furlongs every day, he could carry it as far after it had grown to its full ſize." But in oratory the word *example* is uſed for any kind of ſimilitude; or, as Voſſius defines it, "When one thing is inferred from another, by reaſon of the likeneſs which appears between them." Hence it is called an *imperfect induction*, which infers ſomething from ſeveral others of a like nature, and has always the greateſt force when the examples are taken from facts. Now facts may be compared with reſpect to ſome agreement or ſimilitude between them, which in themſelves are either equal or unequal. Of the former kind this is an inſtance: "Cato acted as became a patriot and a lover of his country's liberty, in oppoſing the arms of Cæſar: and therefore ſo did Cicero." The reaſon of the inference is founded in the parity of the caſe, which equally concerned all good ſubjects of the Roman government at that time. For all were alike obliged to oppoſe a common enemy, who endeavoured to ſubvert the conſtitution, and ſubject them to his own arbitrary power. But though an example conſiſts in the compariſon of two ſingle facts, yet ſeveral perſons may be concerned in each fact. Of this kind is that which follows: "As Pompey, Cæſar, and Craſſus, acted illegally in the firſt triumvirate, by engroſſing the ſole power into their own hands, and by that means violating the public liberty; ſo likewiſe did Auguſtus, Mark Antony, and Lepidus, in the ſecond triumvirate, by purſuing the ſame meaſures." But when Cicero defends Milo for killing Clodius, from the like inſtances of Ahala Servilius, Scipio Nanſica, Lucius Opimius, and others; that is not an example, but an induction: becauſe one thing is there inferred from its ſimilitude to ſeveral others. But when a compariſon is made between two facts that are unequal, the inference may be either from the greater to the leſs, or from the leſs to the greater. From the greater to the leſs in this manner: "Cæſar had no juſt pretenſions to the Roman government, and therefore much leſs had Antony." The reaſon lies in the difference between the two perſons. Cæſar had very much enlarged the bounds of the Roman empire by his conqueſts, and greatly obliged the populace by his generoſity; but as he had always acted by an authority from the ſenate and people of Rome, theſe things gave him no claim to a power over them. Much leſs then had Antony any ſuch pretence, who always acted under Cæſar, and had never performed any ſignal ſervices himſelf. Cicero has deſcribed the difference between them in a very beautiful manner in his ſecond Philippic, thus ſpeaking to Antony: "Are you in any thing to be compared to him? He had a genius, ſagacity, memory, learning, care, thought, diligence; he had performed great things in war, though detrimental to the ſtate; he had for many years deſigned to get the government into his hands, and obtained his end by much labour and many dangers; he gained over the ignorant multitude by public ſhows, buildings, congiaries, and feaſts; obliged his friends by rewards, and his enemies by a ſhow of clemency. In a word, he ſubjected a free ſtate to ſlavery, partly through fear, and partly compliance. I can liken you to him for ambition of power; but in other things you are in no reſpect to be compared with him." By a compariſon from the leſs to the greater, Cicero thus argues againſt Catiline: "Did the brave Scipio, when a private man, kill Tiberius Gracchus, for attempting to weaken the ſtate; and ſhall we conſuls bear with Catiline endeavouring to deſtroy the world by fire and ſword?" The circumſtances of theſe two caſes were very different; and the compariſon runs between a private man and a conſul intruſted with the higheſt authority; between a deſign only to raiſe a tumult, and a plot to deſtroy the government: whence the orator juſtly infers, that what was eſteemed lawful in one caſe, was much more ſo in the other. The like way of reaſoning is ſometimes uſed from other ſimilitudes, which may be taken from things of all kinds, whether animate or inanimate. Of the former ſort is that of Cicero ſpeaking of Muræna, when candidate for the conſulſhip, after he had himſelf gone through that office: "If it is uſual (ſays he) for ſuch perſons as are ſafely arrived in port, to give thoſe who are going out the beſt account they can with relation to the weather, pirates, and coaſts; becauſe thus nature directs us to aſſiſt thoſe who are entering upon the ſame dangers which we ourſelves have eſcaped: how ought I, who now after a great ſtorm am brought within a near proſpect of land, to be affected towards him, who, I perceive, muſt be expoſed to the greateſt tempeſts of the ſtate?" He alludes to the late diſturbances and tumults occaſioned by the conſpiracy of Catiline, which had been ſo happily ſuppreſſed by him in the time of his conſulate. Of the latter kind is that of Quintilian: "As the ground is made better and more fruitful by culture, ſo is the mind by inſtruction." There is both a beauty and juſtneſs in this ſimile.

But compariſons are ſometimes made between facts and other things, in order to infer ſome difference or oppoſition between them. In comparing two facts, on account of ſome diſagreement and unlikeneſs, the inference is made from the difference between one and the other in that particular reſpect only. As thus: "Though it was not eſteemed cruelty in Brutus to put his two ſons to death, for endeavouring to betray their country; it might be ſo in Manlius, who put his ſon to death, only for engaging the enemy without orders, though he gained the victory." The difference between the two facts lies in the different nature of the crime. The ſons of Brutus entered into a conſpiracy to betray their country; and though they miſcarried in it, yet the intention and endeavours they uſed to accompliſh it were criminal in the higheſt degree. But young Manlius could only be charged with raſhneſs. His deſign was honourable, and intended for the intereſt of his country; only it was irregular, and might have proved of ill conſequence to military diſcipline. Now in all ſuch caſes, the force of the argument is the ſtronger the greater the difference appears. But the ſame facts which differ in one reſpect may agree in many others; as in the example here mentioned. Brutus and Manlius were both magiſtrates as well as fathers; they both killed their ſons, and that for a capital crime by the Roman law. In any of which reſpects they may be compared in a way of ſimilitude: as, "If Brutus might lawfully put his ſon to death for a capital crime, ſo might Manlius." But now contrary facts do not only differ in ſome certain reſpect, but are wholly oppoſite to each other; ſo that what is affirmed of the one muſt be denied of the other; and if one be a virtue, the other is a vice. Thus Cicero compares the conduct of Marcellus and Verres in a way of oppoſition. "Marcellus (ſays he), who had engaged, if he took Syracuſe, to erect two temples at Rome, would not beautify them with the ſpoils he had taken: Verres, who had made no vows to Honour and Virtue, but to Venus and Cupid, endeavoured to plunder the temple of Minerva. The former would not adorn the gods with the ſpoils of other deities; the latter carried the ornaments of Minerva, a virgin, into the houſe of a ſtrumpet." If therefore the conduct of Marcellus was laudable and virtuous, that of Verres muſt bear the contrary character. But this way of reaſoning has likewiſe place in other reſpects. Thus Cicero, in the quarrel between Cæſar and Pompey, adviſed to peace from the difference between a foreign and domeſtic war: "That the former might prove beneficial to the ſtate; but in the latter, whichever ſide conquered, the public muſt ſuffer." And thus the ill effects of intemperance may be ſhown in a way of oppoſition: "That as temperance preſerves the health of the body, keeps up the vigour of the mind, and prolongs life; ſo exceſs muſt neceſſarily have the contrary effects.

Thus we have given a brief account of the principal ways of reaſoning commonly made uſe of by orators. As to the diſpoſition of arguments, or the order of placing them, ſome adviſe to put the weaker, which cannot wholly be omitted, in the middle: and ſuch as are ſtronger, partly in the beginning, to gain the eſteem of the hearers, and render them more attentive; and partly at the end, becauſe what is laſt heard is likely to be retained longeſt: But if there are but two arguments, to place the ſtronger firſt, and then the weaker; and after that to return again to the former, and inſiſt principally upon that. But this muſt be left to the prudence of the ſpeaker, and the nature of the ſubject. Though to begin with the ſtrongeſt, and ſo gradually deſcend to the weakeſt, can never be proper, for the reaſon laſt mentioned. Nor ought arguments to be crowded too cloſe upon one another; for that takes off from their force, as it breaks in upon the attention of the hearers, and does not leave them ſufficient time duly to conſider them. Nor indeed ſhould more be uſed than are neceſſary; becauſe the fewer they are, the more eaſily they are remembered. And the obſervation of a great maſter of eloquence upon this ſubject is certainly very juſt, that *arguments ought rather to be weighed than numbered.*

CHAP. V. *Of Confutation.*

36 Forms of confutation the ſame with thoſe of confirmation, but more difficult.

THE forms of reaſoning here are the ſame as have been already explained under *confirmation*. *Confutation*, however, is often the more difficult taſk; becauſe he who is to prove a thing comes uſually prepared: but he who is to confute it is frequently left to a ſudden anſwer. For which reaſon, in *judicial* caſes, Quintilian ſays, "It is as much eaſier to accuſe than defend, as it is to make a wound than to heal it." Therefore, not only a good judgment, but a readineſs of thought alſo, ſeems neceſſary for this province. But, in all diſputes, it is of the greateſt conſequence to obſerve where the ſtreſs of the controverſy lies. For without attending to this, perſons may cavil about different matters without underſtanding each other, or deciding any thing. And in confutation, what the adverſary has advanced ought carefully to be conſidered, and in what manner he has expreſſed himſelf. As to the things themſelves, whether they immediately relate to the matter in diſpute, or are foreign to it. Thoſe things that are foreign to the ſubject may either be paſt over in ſilence, or in a very few words ſhown to be inſignificant. And there ought likewiſe to be a diſtinction made between ſuch things as relate to the ſubject, according to their importance. Thoſe that appear to have no great weight ſhould be ſlightly remarked. For to inſiſt largely upon ſuch matters is both tireſome to the hearers, and apt to bring the judgment of the ſpeaker into queſtion. And therefore things of that nature are generally better turned off with an air of neglect, a pungent queſtion, or an agreeable jeſt, than confuted by a ſerious and laboured anſwer. But thoſe things, which relate to the merits of the cauſe, may be confuted either by *contradicting* them, or by ſhowing ſome *miſtake* in the reaſoning, or their *invalidity* when granted.

Things may be *contradicted* ſeveral ways. What is apparently falſe may be expreſsly *denied*. Thus Cicero in his defence of Cluentius: "When the accuſer had ſaid, that the man fell down dead after he had drunk off his cup, denies that he died that day." And things which the adverſary cannot prove, may likewiſe be denied. Of which we have alſo an inſtance in Cicero, who firſt upbraids Mark Antony as guilty of a breach not only of good breeding, but likewiſe of friendſhip, for reading publicly a private letter he had ſent him:

And then adds, "But what will you ſay now, if I ſhould deny that ever I ſent you that letter? How will you prove it? By the hand-writing? In which I confeſs you have a peculiar ſkill, and have found the benefit of it. But how can you make it out? For it is in my ſecretary's hand. I cannot but envy your maſter who had ſo great a reward for teaching you to underſtand juſt nothing. For what can be more unbecoming not only an orator, but even a man, than for any one to offer ſuch things, which if the adverſary denies he has nothing more to ſay?" It is an handſome way of contradicting a thing, by ſhowing that the adverſary himſelf maintained the contrary. So when Oppius was charged with defrauding the ſoldiers of their proviſions, Cicero refutes it, by proving, that the ſame perſons charged Oppius with a deſign to corrupt the army by his liberality. An adverſary is never more effectually ſilenced than when you can faſten contradictions upon him; for this is ſtabbing him with his own weapon. Sometimes a thing is not in expreſs terms denied, but repreſented to be utterly incredible. And this method expoſes the adverſary more than a bare denial. So when ſome perſons reproached Cicero with cowardice, and a ſhameful fear of death, he recites their reaſons in ſuch a manner, that any one would be inclined to think the charge entirely falſe. "Was it becoming me (ſays he) to expect death with that compoſedneſs of mind as ſome have imagined? Well, and did I then avoid it? Nay, was there any thing in the world that I could apprehend more deſirable? Or when I had done the greateſt things in ſuch a crowd of ill minded perſons about me, do you think baniſhment and death were not always in my view, and continually ſounding in my ears as my certain fate, while I was ſo employed? Was life deſireable when all my friends were in ſuch ſorrow, and myſelf in ſo great diſtreſs, deprived of all the gifts both of nature and fortune? Was I ſo unexperienced, ſo ignorant, ſo void of reaſon and prudence? Had I never ſeen or heard any thing in my whole life? Did all I had read and ſtudied avail nothing? What! did not I know that life is ſhort, but the glory of generous actions permanent? When death is appointed for all, does it not ſeem eligible, that life, which muſt be wreſted from us, ſhould rather be freely devoted to the ſervice of our country, than reſerved to be worn out by the decays of nature? Was not I ſenſible, there has been this controverſy among the wiſeſt men, that ſome ſay, the minds of men and their conſciences utterly periſh at death; and others, that the minds of wiſe and brave men are then in their greateſt ſtrength and vigour, when they are ſet free from the body? The firſt ſtate is not greatly to be dreaded, to be void of ſenſe: but the other, of enjoying larger capacities, is greatly to be deſired. Therefore, ſince I always aimed at dignity, and thought nothing was worth living for without it; how ſhould I, who am paſt the conſulſhip, and did ſo great things in it, be afraid to die?" Thus far Cicero. There is likewiſe an ironical way of contradicting a thing, by retorting that and other things of the like nature upon the adverſe party: Thus Cicero, in his oration againſt Vatinius, ſays: "You have objected to me, that I defended Cornelius, my old friend, and your acquaintance. But pray why ſhould I not have defended him? Has Cornelius carried any law contrary to the omens? Has he violated any law? Has he aſſaulted the conſul? Did he take poſſeſſion of a temple by force of arms? Did he drive away the tribune, who oppoſed the paſſing a law? Has he thrown contempt upon religion? Has he plundered the treaſury? Has he pillaged the ſtate? No, theſe, all theſe, are your doings." Such an unexpected return is ſometimes of great ſervice to abate the confidence of an adverſary.

A ſecond way of confutation is, by obſerving ſome *flaw* in the reaſoning of the adverſe party. We ſhall endeavour to illuſtrate this from the ſeveral kinds of reaſoning treated of before under *confirmation*. And firſt, as to ſyllogiſms; they may be refuted, either by ſhowing ſome miſtake in the premiſes, or that the concluſion is not juſtly deduced from them. So when the Clodian party contended, that Milo ought to ſuffer death for this reaſon, Becauſe he had confeſſed that he had killed Clodius; that argument, reduced to a ſyllogiſm, would ſtand thus:

He who confeſſes he has killed another, ought not to be allowed to ſee the light.
But Milo confeſſes this.
Therefore he ought not to live.

Now the force of this argument lies in the major or firſt propoſition; which Cicero refutes, by proving, that the Roman people had already determined contrary to what is there aſſerted: "In what city (ſays he) do theſe men diſpute after this weak manner? In that wherein the firſt capital trial was in the caſe of the brave Horatius, who, before the city enjoyed perfect freedom, was ſaved by the ſuffrages of the Roman people, though he confeſſed that he killed his ſiſter with his own hand." But when Cicero accuſed Verres for mal-adminiſtration in his government of Sicily, Hortenſius, who defended him, being ſenſible the allegations brought againſt him could not be denied, had no other way left to bring him off, but by pleading his military virtues in abatement, which at that time were much wanted, and very ſerviceable to the ſtate. The form of the argument was this:

That the Romans then wanted good generals.
That Verres was ſuch.
And conſequently, that it was for the intereſt of the public that he ſhould not be condemned.

But Cicero, who knew his deſign, ſtates the argument for him in his charge; and then anſwers it by denying the conſequence, ſince the crimes of Verres were of ſo heinous a nature, that he ought by no means to be pardoned on the account of any other qualifications: Though indeed he afterwards refutes the minor or ſecond propoſition, and ſhows that he had not merited the character of a good general. Enthymems may be refuted, either by ſhowing that the antecedent is falſe, or the conſequent not juſtly inferred from it. As thus, with reſpect to the former caſe:

A ſtrict adherence to virtue has often proved detrimental.
Therefore virtue ought not conſtantly to be embraced.

Here the antecedent may be denied. For virtue is alway beneficial to thoſe who ſtrictly adhere to it, both in the preſent ſatisfaction it affords them, and the future rewards they may certainly expect from it. And as to the latter caſe, in this manner:

> *She is a mother,*
> *Therefore ſhe loves her children.*

Now as the certainty of that inference depends upon this general aſſertion, That all mothers love their children, which is not true, the miſtake of the reaſoning may be ſhown from the inſtance of Medea and others, who deſtroyed their own children. As to *induction* and *example*, by which the truth or equity of a thing is proved from its likeneſs to one or more other things; the reaſoning in either is invalid, if the things ſo compared can be ſhown not to have that ſimilitude or agreement on which the inference is founded. One inſtance therefore may ſerve for both. As when Cicero, after the death of Cæſar, pleaded for the continuance of his laws, but not of thoſe which were made afterwards by Mark Antony: Becauſe, though both were in themſelves invalid, and impoſitions upon the public liberty; yet ſome of Cæſar's were uſeful, and others could not be ſet aſide without diſturbance to the ſtate, and injuring particular perſons; but thoſe of Antony were all detrimental to the public.

The laſt method of *confutation* before-mentioned was, when the orator does in ſome ſenſe *grant* the adverſary his argument, and at the ſame time ſhows its *invalidity*. And this is done by a variety of ways, according to the different nature of the ſubject. Sometimes he allows what was ſaid may be true; but pleads, that what he contends for is neceſſary. This was the method by which Hortenſius propoſed to bring off Verres, as we have already ſhown from Cicero, whoſe words are theſe, addreſſing himſelf to the judges: "What ſhall I do? which way ſhall I bring in my accuſation? where ſhall I turn myſelf? for the character of a brave general is placed like a wall againſt all the attacks I can make. I know the place, I perceive where Hortenſius intends to diſplay himſelf. He will recount the hazards of war, the neceſſities of the ſtate, the ſcarcity of commanders; and then he will intreat you, and do his utmoſt to perſuade you not to ſuffer the Roman people to be deprived of ſuch a commander upon the teſtimony of the Sicilians, nor the glory of his arms to be ſullied by a charge of avarice." At other times the orator pleads, that although the contrary opinion may ſeem to be attended with advantage, yet that his own is more juſt, or honourable. Such was the caſe of Regulus, when his friends endeavoured to prevail with him to continue at Rome, and not return to Carthage, where he knew he muſt undergo a cruel death. But as this could not be done without violating his oath, he refuſed to hearken to their perſuaſions. Another way of confutation is, by retorting upon the adverſary his own argument. Thus Cicero, in his defence of Ligarius, ſays: "You have, Tubero, that which is moſt deſirable to an accuſer, the confeſſion of the accuſed party; but yet ſuch a confeſſion, that he was on the ſame ſide that you, Tubero, choſe yourſelf, and your father too, a man worthy of the higheſt praiſe. Wherefore, if there was any crime in this, you ought firſt to confeſs your own before you attempt to faſten any upon Ligarius." The orator takes this advantage where an argument proves too much, that is, more than the perſon deſigned it for, who made uſe of it. Not much unlike this is what they call *inverſion*, by which the orator ſhows, that the reaſons offered by the oppoſite party make for him. So when Cæcilius urged, that the province of accuſing Verres ought to be granted to him, and not to Cicero, becauſe he had been his treaſurer in Sicily at the time thoſe crimes were committed with which he was charged, and conſequently knew moſt of that affair; Cicero turns the argument upon him, and ſhows, for that very reaſon he was the moſt unfit of any man to be intruſted with his proſecution; ſince having been concerned with him in his crimes, he would certainly do all in his power to conceal or leſſen them. Again, ſometimes the charge is acknowledged, but the crime ſhifted off to another. Thus, when Sextius was accuſed of ſedition, becauſe he had got together a body of gladiators, and brought them into the forum, where a warm engagement happened between them and Clodius's faction; Cicero owns the fact, but charges the crime of ſedition upon Clodius's party in being the aggreſſors. Another method made uſe of for the ſame purpoſe is to alleviate the charge, and take off the force of it, by ſhowing, that the thing was not done with that intention which the adverſary inſinuates. Thus Cicero, in his defence of King Dejotarus, owns he had raiſed ſome forces, though not to invade the Roman territories, as had been alledged, but only to defend his own borders, and ſend aid to the Roman generals.

We have hitherto been ſpeaking of the methods of confutation uſed by orators, in anſwering thoſe arguments which are brought by the contrary party. But ſometimes they raiſe ſuch objections themſelves to what they have ſaid, as they imagine may be made by others; which they afterwards anſwer, the better to induce their hearers to think that nothing conſiderable can be offered againſt what they have advanced, but what will admit of an eaſy reply. Thus, when Cicero, at the requeſt of the Sicilians, had undertaken the accuſation of Verres, it came under debate, whether he, or Cæcilius, who had been Verres's quæſtor in Sicily, ſhould be admitted to that province. Cicero, therefore, in order to ſet him aſide, among other arguments, ſhows his incapacity for ſuch an undertaking, and for that end recounts at large the qualifications neceſſary for an orator. Which he repreſents to be ſo many and great, that he thought it neceſſary to ſtart the following objection to what he had himſelf ſaid upon that ſubject. "But you will ſay perhaps, Have you all theſe qualifications?" To which he thus replies: "I wiſh I had; but it has been my conſtant ſtudy from my youth to gain them. And if, from their greatneſs and difficulty, I have not been able to attain them, who have done nothing elſe through my whole life; how far, do you imagine, you muſt be from it, who never thought of them before; and even now, when you are entering upon them, have no apprehenſion what, and how great, they are?" This is an effectual way of defeating an adverſary, when the objection is well founded, and clearly anſwered. But we ſhall have occaſion to conſider this matter more largely hereafter, under the figure *prolepſis*, to which it properly relates.

CHAP.

Chap. VI. *Of the Concluſion.*

37 The concluſion is a recapitulation and addreſs to the paſſions.

Rhetoricians make the *concluſion* of a diſcourſe to conſiſt of two parts: *recapitulation*, and *an addreſs to the paſſions*.

1. *Recapitulation* is a ſummary account of what the ſpeaker has before offered in maintenance of his ſubject; and is deſigned both to refreſh the memory of the hearers, and to bring the principal arguments together into a narrow compaſs, that they may appear in a ſtronger light. Now there are ſeveral things neceſſary to a good repetition.

And firſt, it muſt be ſhort and conciſe; ſince it is deſigned to refreſh the memory, and not to burden it. For this end, therefore, the chief things only are to be touched upon; thoſe on which the cauſe principally depends, and which the orator is moſt deſirous ſhould be regarded by his hearers. Now theſe are, The general heads of the diſcourſe, with the main arguments brought to ſupport them. But either to inſiſt particularly upon every minute circumſtance, or to enlarge upon thoſe heads which it may be thought proper to mention, carries in it not ſo much the appearance of a repetition, as of a new diſcourſe.

Again, it is convenient in a repetition to recite things in the ſame order in which they were at firſt laid down. By this means the hearers will be enabled much better to keep pace with the ſpeaker as he goes along; and if they happen to have forgot any thing, they will the more readily recal it. And beſides, this method appears moſt ſimple and open, when the ſpeaker reviews what he has ſaid in the ſame manner it was before delivered, and ſets it in the cleareſt light for others to judge of it. But though a repetition contains only the ſame things which had been more largely treated of before; yet it is not neceſſary they ſhould be expreſſed in the ſame words. Nay, this would many times be tireſome and unpleaſant to the hearers; whereas a variety of expreſſion is grateful, provided the ſenſe be the ſame. Beſides, every thing ought now to be repreſented in the ſtrongeſt terms, and in ſo lively a manner, as may at the ſame time both entertain the audience, and make the deepeſt impreſſion upon their minds. We have a very exact and accurate example of repetition in Cicero's oration for Quintius. Cicero was then a young man, and ſeems to have kept more cloſely to the rules of art, than afterwards when, by uſe and practice, he had gained a greater freedom of ſpeaking. We formerly cited the partition of this ſpeech, upon another occaſion, which runs thus: "We deny, Sextus Nævius, that you were put into the poſſeſſion of the eſtate of P. Quintius, by the prætor's edict. This is the diſpute between us. I will therefore ſhow, firſt, that you had no juſt cauſe to apply to the prætor for the poſſeſſion of the eſtate of P. Quintius; then, that you could not poſſeſs it by the edict; and laſtly, that you did not poſſeſs it. When I have proved theſe three things, I will conclude." Now Cicero begins his concluſion with a repetition of thoſe three heads, and a ſummary account of the ſeveral arguments he made uſe of under each of them. But they are too long to be here exhibited. In his oration for the Manilian law, his repetition is very ſhort. He propoſed in the partition to ſpeak to three things: The nature of the war againſt king Mithridates, the greatneſs of it, and what ſort of general was proper to be intruſted with it. And when he has gone through each of theſe heads, and treated upon them very largely, he reduces the ſubſtance of what he has ſaid to this general and ſhort account: "Since therefore the war is ſo neceſſary, that it cannot be neglected; and ſo great, that it requires a very careful management; and you can intruſt it with a general of admirable ſkill in military affairs, of ſingular courage, the greateſt authority, and eminent ſucceſs: do you doubt to make uſe of this ſo great a bleſſing, conferred and beſtowed upon you by heaven, for the preſervation and enlargement of the Roman ſtate?" Indeed this repetition is made by Cicero, before he proceeds to the confutation; and not at the end of his diſcourſe, where it is uſually longer and more particular: however, this may ſerve to ſhow the nature of ſuch a recital.

But ſometimes a repetition is made, by running a compariſon between the ſpeaker's own arguments and thoſe of the adverſe party; and placing them in oppoſition to each other. And this method Cicero takes in the concluſion of his third oration upon the Agrarian law. And here ſometimes the orator takes occaſion to find fault with his adverſary's management, in theſe and ſuch like expreſſions: "This part he has entirely dropt. To that he has given an invidious turn, or a falſe colouring. He leaves arguments, and flies to intreaties; and not without good reaſon, if we conſider the weakneſs of his cauſe."

But when the diſcourſe is very long, and the arguments inſiſted on have been many, to prevent the hearers growing out of patience by a more particular recital, the orator ſometimes only juſt mentions ſuch things, which he thinks of leaſt conſequence, by ſaying, that he omits or paſſes over them, till he comes to what is of greater moment, which he repreſents more fully. This method Cicero has taken in his defence of Cluentius; where, having run over ſeveral leſſer heads in the manner now deſcribed, he then alters his expreſſion, and introduces what was of more importance, by ſaying, "What I firſt complain of, is that wickedneſs, which is now diſcovered." And ſo he proceeds more particularly to recite thoſe things which immediately related to Cluentius. And this is what the writers upon this art call *preterition*. But this much may ſerve for repetition or recapitulation.

2. We now proceed to the other part of the concluſion, which conſiſts in an *addreſs to the paſſions*. Indeed the orator ſometimes endeavours occaſionally to work upon the paſſions of his hearers in other parts of his diſcourſe, but more eſpecially in the concluſion, where he is warmeſt himſelf, and labours to make them ſo. For the main deſign of the introduction is to conciliate the hearers, and gain their attention; of the narration, propoſition, and confirmation, to inform them; and of the concluſion, to move them. And therefore, to uſe Quintilian's words, "Here all the ſprings of eloquence are to be opened. It is here we ſecure the minds of the hearers, if what went before was well managed. Now we are paſt the rocks and ſhallows, all the ſails may be hoiſted. And as the greateſt part of the concluſion conſiſts in illuſtration, the moſt pompous language and ſtrongeſt figures have

place here." Now the paſſions, to which the orator more particularly addreſſes, differ according to the nature of the diſcourſe. In demonſtrative orations, when laudatory,—love, admiration, and emulation, are uſually excited; but in invectives, hatred, envy, and contempt. In deliberative ſubjects, either the hope of gratifying ſome deſire is ſet in view, or the fear of ſome impending evil. And in judicial diſcourſes, almoſt all the paſſions have place, but mor eſpecially reſentment and pity; inſomuch that moſt of the ancient rhetoricians mention only theſe two. But having treated upon the nature of the paſſions, and the methods ſuited both to excite and allay them, in a former chapter, we ſhall at preſent only add a few general obſervations, which may not be improper in this place, where the ſkill of the orator in addreſſing to them is more eſpecially required.

The orator will obſerve what circumſtances either of things, or perſons, or both, will furniſh him with motives proper to apply to thoſe paſſions he deſires to excite in the minds of his hearers. Thus Cicero, in his orations for Plancus and Sylla, moves his hearers from the circumſtances of the men; but in his accuſation of Verres, very frequently from the barbarity and horrid nature of his crimes; and from both, in his defence of Quintius.

But the ſame paſſion may be excited by very different methods. This is plain from the writings of thoſe Roman ſatyriſts which are yet extant; for they have all the ſame deſign, and that is to engage men to a love of virtue, and hatred of vice: but their manner is very different, ſuited to the genius of each writer. Horace endeavours to recommend virtue, by laughing vice out of countenance; Perſius moves us to an abhorrence and deteſtation of vice, with the gravity and ſeverity of a philoſopher; and Juvenal, by open and vehement invectives. So orators make uſe of all theſe methods in exciting the paſſions; as may be ſeen by their diſcourſes, and particularly thoſe of Cicero. But it is not convenient to dwell long upon the ſame paſſion. For the image thus wrought up in the minds of the hearers does not laſt a great while; but they ſoon return to reflection. When the emotion, therefore, is once carried as high as it well can be, they ſhould be left under its influence, and the ſpeaker proceed to ſome new matter, before it declines again.

Moreover, orators ſometimes endeavour to raiſe contrary paſſions to each other, as they are concerned for oppoſite parties. So the accuſer excites anger and reſentment, but the defendant pity and compaſſion. At other times, one thinks it ſufficient to allay and take off that paſſion which the other has raiſed, and bring the hearers to a calm and ſedate conſideration of the matter before them.

But this eſpecially is to be regarded, that the orator expreſs the ſame paſſion himſelf with which he endeavours to affect others; and that not only in his action and voice, but likewiſe in his language: and therefore his words, and manner of expreſſion, ſhould be ſuited to that perturbation and diſorder of mind which he deſigns to repreſent. However, a decency and propriety of character is always carefully to be obſerved; for, as Cicero very well remarks, "A neglect of this is not only very culpable in life, but likewiſe in diſcourſe. Nor do the ſame things equally become every ſpeaker, or every audience; nor every time, and every place." And therefore he greatly commends that painter, who, deſigning to repreſent in a picture the ſacrifice of Ephigenia, Agamemnon's daughter, drew Calchas the prieſt with a ſad countenance; Ulyſſes, her father's great friend, more dejected; and her uncle Menelaus, moſt diſconſolate; but threw a veil over the face of Agamemnon himſelf, as being unable to expreſs that exceſs of ſorrow which he thought was proper to appear in his countenance. And this juſtneſs of character is admirably well obſerved by Cicero himſelf, in his defence of Milo; for as Milo was always known to be a man of the greateſt reſolution, and moſt undaunted courage, it was very improper to introduce him (as the uſual method then was in capital caſes) moving pity, and begging for mercy. Cicero therefore takes this part upon himſelf; and what he could not do with any propriety in the perſon of Milo, he performs in his own, and thus addreſſes the judges: "What remains, but that I intreat and beſeech you, that you would ſhow that compaſſion to this brave man, for which he himſelf does not ſolicit, but I, againſt his inclination, earneſtly implore and requeſt. Do not be leſs inclined to acquit him, if in this our common ſorrow, you ſee no tear fall from Milo's eyes; but perceive in him the ſame countenance, voice, and language, as at other times, ſteady and unmoved. Nay, I know not whether for this reaſon, you ought not much ſooner to favour him: For if, in the conteſts of gladiators (perſons of the loweſt condition and fortune in life), we are wont to be diſpleaſed with the timorous and ſuppliant, and thoſe who beg for their life; but interpoſe in favour of the brave and courageous, and ſuch as expoſe themſelves to death; and we ſhow more compaſſion to thoſe who do not ſue for it, than to thoſe who do: with how much greater reaſon ought we to act in the ſame manner towards the braveſt of our fellow citizens?" And as theſe words were agreeable to his own character, while ſoliciting in behalf of another; ſo, immediately after, he introduces Milo ſpeaking like himſelf, with a generous and undaunted air: "Theſe words of Milo (ſays he) quite ſink and diſpirit me, which I daily hear from him. Farewel, farewel, my fellow citizens, farewel! may you be happy, flouriſh, and proſper; may this renowned city be preſerved, my moſt dear country, however it has treated me; may it continue in peace, though I cannot continue in it, to whom it owes its peace. I will retire, I will be gone."

But as perſons are commonly more affected with what they ſee than with what they hear, orators ſometimes call in the aſſiſtance of that ſenſe in moving the paſſions. For this reaſon it was uſual among the Romans, in judicial caſes, for accuſed perſons to appear with a dejected air and a ſordid garb, attended by their parents, children, or other relations and friends, with the like dreſs and aſpect; as likewiſe to ſhow their ſcars, wounds, bloody garments, and other things of the like nature, in open court. So when, upon the death of Cæſar, Mark Antony harangued the populace, he at the ſame time expoſed to their view the garment in which he was ſtabbed, fixed upon a pole; at which ſight they were ſo enraged, that immediately they ran with lighted torches to ſet fire to the houſes of the conſpirators. But this cuſtom at laſt became ſo common, and was ſometimes ſo ill conducted, that the force of it was greatly abated, as we learn from Quintilian. However, if the Romans proceeded to an exceſs on the one hand, the ſtrictneſs of the Areopagites at Athens may perhaps be thought too rigid on the other; for in that court, if the orator began to ſay any thing which was moving, an officer immediately ſtood up and bade him be ſilent. There is certainly a medium between theſe two extremes, which is ſometimes not only uſeful, but even neceſſary: for, as Quintilian very juſtly ſays, "It is neceſſary to apply to the paſſions, when thoſe things which are true, juſt, and of common benefit, cannot be come at any other way."

CHAP. VII. *Of Digreſſion, Tranſition, and Amplification.*

38 Digreſſion, tranſition, and amplification, defined and explained.

THE number, order, and nature of the parts which conſtitute a complete and regular oration, we have endeavoured to explain in ſeveral preceding chapters. But there are two or three things yet remaining, very neceſſary to be known by an orator, which ſeems moſt properly to come under the ſecond branch of his art.— And theſe are, *Digreſſion, Tranſition, and Amplification.*

I. *Digreſſion*, as defined by Quintilian, is, "A going off from the ſubject we are upon to ſome different thing, which may however be of ſervice to it." We have a very beautiful inſtance of this in Cicero's defence of Cœlius, who was accuſed of having firſt borrowed money of Clodia, and then engaging her ſervants to poiſon her. Now, as the proof of the fact depended upon ſeveral circumſtances, the orator examines them ſeparately; and ſhows them to be all highly improbable. "How (ſays he) was the deſign of this poiſon laid? Whence came it? how did they get it? by whoſe aſſiſtance, to whom, or where, was it delivered?" Now to the firſt of theſe queries he makes the accuſer give this anſwer "They ſay Cœlius had it at home, and tried the force of it upon a ſlave provided on purpoſe, whoſe ſudden death proved the ſtrength of the poiſon" Now as Cicero repreſents the whole charge againſt Cœlius as a fiction of Clodia, invented out of revenge for ſome ſlights he had put upon her; to make this the more probable, he inſinuates that ſhe had poiſoned her huſband, and takes this opportunity to hint it, that he might ſhow how eaſy it was for her to charge another with poiſoning a ſervant, who had done the ſame to her own huſband But not contented with this, he ſteps out of his way, and introduces ſome of the laſt words of her huſband Metellus, to render the fact more barbarous and ſhocking, from the admirable character of the man. "O immortal gods! why do you ſometimes wink at the greateſt crimes of mankind, or delay the puniſhment of them to futurity! For I ſaw, I myſelf ſaw (and it was the moſt doleful ſcene of my whole life) when Q. Metellus was taken from the boſom of his country; and when he, who thought himſelf born to be ſerviceable to this ſtate, within three days after he had appeared with ſuch advantage in the ſenate, in the forum, and everywhere in public, was ſnatched from us in the flower of his age, and prime of his ſtrength and vigour. At which time, when he was about to expire, and his mind had loſt the ſenſe of other things, ſtill retaining a concern for the public, he looked upon me, as I was all in tears, and intimated in broken and dying words, how great a ſtorm hung over the city and threatened the whole ſtate; often ſtriking the wall which ſeparated his houſe from that of Quintus Catulus, and frequently calling both upon him and me, and ſeeming to grieve not ſo much at the approach of his own death, as that both his country and I ſhould be deprived of his aſſiſtance. Had he not been wickedly taken off on a ſudden, how would he after his conſulſhip have withſtood the fury of his kinſman Publius Clodius, who, while in that office, threatened, in the hearing of the ſenate, to kill him with his own hand, when he firſt began to break out? And will this woman dare to come out of thoſe doors, and talk of the force of poiſon? will not ſhe fear, leſt the houſe itſelf ſhould ſpeak the villany? will not ſhe dread the conſcious walls, nor that ſad and mournful night? But I return to the accuſation." And then he proceeds to conſider and refute the ſeveral circumſtances of the accuſation. All this was no part of his argument; but having mentioned the charge of poiſon, he immediately takes occaſion to introduce it, in order to excite the indignation of the hearers againſt Clodia, and invalidate the proſecution as coming from a perſon of her character. Digreſſion cannot properly be ſaid to be a neceſſary part of a diſcourſe; but it may ſometimes be very convenient, and that upon ſeveral accounts.

As firſt, when a ſubject is of itſelf flat and dry, or requires cloſe attention, it is of uſe to relieve and unbend the mind by ſomething agreeable and entertaining. For which reaſon Quintilian obſerves, that the orators of his time generally made an excurſion in their harangues upon ſome pleaſing topic, between the narration and the proof. But he condemns the practice as too general; for while they ſeemed to think it neceſſary, it obliged them ſometimes to bring in things trifling and foreign to the purpoſe. Beſides, a digreſſion is confined to no one part of a diſcourſe, but may come in anywhere, as occaſion offers; provided it fall in naturally with the ſubject, and be made ſome way ſubſervient to it. We never meet with it in Cicero, without ſome evident and good reaſon. So in his proſecution of Verres for his barbarous and inhuman outrages againſt the Sicilians, he takes an occaſion to launch out in a beautiful deſcription of the iſland, and to recount the advantages which accrued from it to the Romans. His ſubject did not neceſſarily lead him to this, but his view in it was to heighten and aggravate the charge againſt Verres.

Again, as a *digreſſion* ought not to be made without ſufficient reaſon, ſo neither ſhould it be too frequent. And he who never does it but where it is proper and uſeful, will not often ſee occaſion for it. Frequently to leave the ſubject, and go off to other things, breaks the thread of the diſcourſe, and is apt to introduce confuſion Indeed ſome kinds of writing admit of a more frequent uſe of digreſſions than others. In hiſtory they are often very ſerviceable. For as that conſiſts of a ſeries of facts, and a long continued narrative without variety, is apt to grow dull and tedious; it is neceſſary at proper diſtances to throw in ſomething entertaining, in order to enliven it, and keep up the attention. And accordingly we find the beſt hiſtorians often embelliſh their writings with deſcriptions of cities, rivers, and countries, as likewiſe with the ſpeeches of eminent perſons upon important occaſions, and other ornaments, to render them the more pleaſing and delightful. Poets take a ſtill greater liberty in this reſpect; for as their principal view is moſt commonly to pleaſe, they do not attend ſo cloſely to connection; but as an image offers itſelf, which may be agreeably wrought up, they bring it in, and go off more frequently to different things, than other writers.

Another property of a *digreſſion* is, that it ought not to be too long, leſt the hearers forget what preceded, before the ſpeaker returns again to his ſubject.

For a digreſſion being no principal part of a diſcourſe, nor of any further uſe than as it ſerves ſome way or other to enforce or illuſtrate the main ſubject; it cannot anſwer this end, if it be carried to ſuch a length, as to cauſe that either to be forgotten or neglected. And every one's memory will not ſerve him to connect together two parts of a diſcourſe, which lie at a wide diſtance from each other. The better therefore to guard againſt this, it is not unuſual with orators, before they enter upon a digreſſion of any conſiderable length, to prepare their hearers by giving them notice of it, and ſometimes deſiring leave to divert a little from the ſubject. And ſo likewiſe at the concluſion they introduce the ſubject again by a ſhort tranſition. Thus Cicero in the example cited above, when he has finiſhed his digreſſion concerning the death of Metellus, proceeds to his ſubject again with theſe words: "But I return to the accuſation."

Indeed we find orators ſometimes, when ſore preſſed, and the cauſe will not bear a cloſe ſcrutiny, artfully run into digreſſions with a deſign to divert the attention of the hearers from the ſubject, and turn them to a different view. And in ſuch caſes, as they endeavour to be unobſerved, ſo they do it tacitly without any tranſition or intimation of their deſign; their buſineſs being only to get clear of a difficulty, till they have an opportunity of entering upon ſome freſh topic.

39
Tranſitions often uſed on various occaſions.

II. *Tranſitions* are often uſed not only after a digreſſion, but likewiſe upon other occaſions. A tranſition is, "A form of ſpeech, by which the ſpeaker in a few words tells his hearers both what he has ſaid already, and what he next deſigns to ſay." Where a diſcourſe conſiſts of ſeveral parts, this is often very proper in paſſing from one to another, eſpecially when the parts are of a conſiderable length; for it aſſiſts the hearers to carry on the ſeries of the diſcourſe in their mind, which is a great advantage to the memory. It is likewiſe a great relief to the attention, to be told when an argument is finiſhed, and what is to be expected next. And therefore we meet with it very frequently in hiſtory. But we conſider it at preſent only as made uſe of by orators. Cicero, in his ſecond oration againſt Catiline, who had then left Rome, having at large deſcribed his conduct and deſigns, he adds: "But why do I talk ſo long concerning one enemy, and ſuch an one; who owns himſelf an enemy, and whom I do not fear, ſince, what I always deſired, there is now a wall between us; and ſay nothing of thoſe, who conceal themſelves, who remain at Rome, and among us?" And then he proceeds to give an account of the other conſpirators.

But ſometimes, in paſſing from one thing to another, a general hint of it is thought ſufficient to prepare the hearers without particularly ſpecifying what has been ſaid, or is next to follow. Thus Cicero in his ſecond Philippic ſays, "But thoſe things are old, this is yet freſh." And again: "But I have inſiſted too long upon trifles, let us come to things of greater moment." And at other times, for greater brevity, the tranſition is imperfect, and mention made only of the following head, without any intimation of what has been ſaid already. As in Cicero's defence of Muræna, where he ſays: "I muſt now proceed to the third part of my oration concerning the charge of bribery." And ſoon after: I come now to Cato, who is the ſupport and ſtrength of this charge."

40
Amplification defined and explained.

III. The third and laſt head is, *Amplification.* Now by amplification is meant, not barely a method of enlarging upon a thing; but ſo to repreſent it in the fulleſt and moſt comprehenſive view, as that it may in the livelieſt manner ſtrike the mind and influence the paſſions. Cicero, ſpeaking of this, calls it *the greateſt commendation of eloquence;* and obſerves, "that it conſiſts not only in magnifying and heightening a thing, but likewiſe in extenuating and leſſening it." But though it conſiſts of theſe two parts, and may be applied either way; yet to amplify, is not to ſet things in a falſe light, but to paint them in their juſt proportion and proper colours, ſuitable to their nature and qualities. Rhetoricians have obſerved ſeveral ways of doing this.

One is to aſcend from a particular thing to a general. Thus Cicero, in his defence of Archias, having commended him as an excellent poet, and likewiſe obſerved, that all the liberal arts have a connection with each other, and a mutual relation between them, in order to raiſe a juſt eſteem of him in the minds of his hearers, takes occaſion to ſay many things in praiſe of polite literature in general, and the great advantages that may be received from it. "You will aſk me (ſays he), why we are ſo delighted with this man? Becauſe he ſupplies us with thoſe things which both refreſh our minds after the noiſe of the forum, and delight our ears when wearied with contention. Do you think we could either be furniſhed with matter for ſuch a variety of ſubjects, if we did not cultivate our minds with learning; or bear ſuch a conſtant fatigue, without affording them that refreſhment? I own I have always purſued theſe ſtudies; let thoſe be aſhamed, who have ſo given up themſelves to learning, as neither to be able to convert it to any common benefit, nor diſcover it in public. But why ſhould it ſhame me, who have ſo lived for many years, that no advantage or eaſe has ever diverted me, no pleaſure allured me, nor ſleep retarded me from this purſuit. Who then can blame me, or who can juſtly be diſpleaſed with me, if I have employed that time in reviewing theſe ſtudies, which has been ſpent by others in managing their affairs, in the celebration of feſtivals, or other diverſions in refreſhments of mind and body, in unſeaſonable banquets, in dice, or tennis? And this ought the rather to be allowed me, becauſe my ability as an orator has been improved by thoſe purſuits, which, ſuch as it is, was never wanting to aſſiſt my friends. And if it be eſteemed but ſmall, yet I am ſenſible from what ſpring I muſt draw thoſe things which are of the greateſt importance." With more to the ſame purpoſe; from which he draws this inference: "Shall I not therefore love this man? ſhall I not admire him? ſhall I not by all means defend him?"

A contrary method to the former is, to deſcend from a general to a particular. As if any one, while ſpeaking in commendation of eloquence, ſhould illuſtrate what he ſays from the example of Cicero, and ſhow the great ſervices he did his country, and the honours he gained to himſelf, by his admirable ſkill in oratory. Our common way of judging of the nature of things is from what we obſerve in particular inſtances, by which we form general notions concerning them. When therefore we conſider the character of Cicero, and the figure he made in the word, it leads us to conclude, there muſt be ſomething very admirable in that art by which he became ſo celebrated. And this method he has taken himſelf in his oration for the Manilian law, where having firſt intimated the ſcarcity of good generals at that time among the Romans, he then deſcribes the virtues of a complete commander as a proof of it, and ſhows how many and great qualifications are neceſſary to form ſuch a character, as courage, prudence, experience, and ſucceſs: all which he afterwards applies to Pompey.

A third method is by an enumeration of parts. So when Cicero, upon the defeat of Mark Antony before Mutina, propoſed that a funeral monument ſhould be erected in honour of the ſoldiers who were killed in that battle, as a comfort to their ſurviving relations; he does it in this way, to give it the greater weight: "Since (ſays he) the tribute of glory is paid to the beſt and moſt valiant citizens by the honour of a monument, let us thus comfort their relations, who will receive the greateſt conſolation in this manner; their parents who produced ſuch brave defenders of the ſtate; their children who will enjoy theſe domeſtic examples of fortitude; their wives, for the loſs of ſuch huſbands, whom it will be more fitting to extol than lament; their brethren, who will hope to reſemble them no leſs in their virtues than their aſpect. And I wiſh we may be able to remove the grief of all theſe by our reſolutions." Such repreſentations greatly enlarge the image of a thing, and afford the mind a much clearer view of it than if it were contracted into one ſingle propoſition.

Again, another method not much unlike the former is, when any thing is illuſtrated from a variety of cauſes. Thus Cicero juſtifies his behaviour in retiring, and not oppoſing his enemies, when they ſpirited up the mob in order to baniſh him, from the following reaſons, which at that time determined him to ſuch a conduct: "When (ſays he) unleſs I was given up, ſo many armed fleets ſeemed ready to attack this ſingle ſhip of the ſtate, toſſed with the tempeſts of ſeditions and diſcords, and the ſenate was now removed from the helm; when baniſhment, murder, and outrage, were threatened; when ſome, from an apprehenſion of their own danger, would not defend me; others were incited by an inveterate hatred to all good men, others thought I ſtood in the way, others took this opportunity to expreſs their reſentment, others envied the peace and tranquillity of the ſtate; and upon all theſe accounts I was particularly ſtruck at: ſhould I have choſen rather to oppoſe them (I will not ſay to my own certain deſtruction, but to the greateſt danger both of you and your children), than alone to ſubmit to and undergo what threatened us all in common?" Such a number of reaſons brought together, muſt ſet a thing in a very ſtrong and clear light.

The like may be ſaid of a number and variety of effects. Thus Cicero deſcribes the force and excellence of oratory from its great and ſurpriſing effects, when he ſays, "Nothing ſeems to be more excellent, than by diſcourſe to draw the attention of a whole aſſembly, delight them, and ſway their inclinations different ways at pleaſure. This, in every free ſtate, and eſpecially in times of peace and tranquillity, has been always in the higheſt eſteem and reputation. For what is either ſo admirable, as for one only, or a very few, out of a vaſt multitude, to be able to do that which all have a natural power of doing? or ſo delightful to hear, as a judicious and ſolid diſcourſe in florid and polite language? or ſo powerful and grand, as to influence the populace, the judges, the ſenate, by the charms of eloquence? Nay, what is ſo noble, ſo generous, ſo munificent, as to afford aid to ſupplicants, to ſupport the afflicted, give ſafety, deliver from dangers, and preſerve from exile? Or what is ſo neceſſary as to be always furniſhed with arms to guard yourſelf, aſſert your right, or repel injuries? And, not to confine our thoughts wholly to the courts of juſtice or the ſenate, what is there in the arts of peace more agreeable and entertaining than good language and a fine way of ſpeaking? For it is this eſpecially wherein we excel other animals, that we can diſcourſe together, and convey our thoughts to each other by words. Who therefore would not eſteem, and in a particular manner endeavour to ſurpaſs others in that wherein mankind principally excels brute beaſts? But to proceed to its chief advantages: What elſe would have drawn men into ſocieties or taken them off from a wild and ſavage life, and ſoften them into a polite and civilized behaviour; or, when ſettled in communities, have reſtrained them by laws?" Who but, after ſuch a deſcription, muſt conceive the ſtrongeſt paſſion for an art attended with ſo many great and good effects?

A thing may likewiſe be illuſtrated by its oppoſite. So the bleſſings and advantages of peace may be recommended from the miſeries and calamities of war; and thus Cicero endeavours to throw contempt upon Catiline and his party by comparing them with the contrary ſide: "But if, omitting all theſe things with which we abound, and they want, the ſenate, the knights, the populace, the city, treaſury, revenues, all Italy, the provinces, and foreign nations; if, I ſay, omitting theſe things, we compare the cauſes themſelves in which each ſide is engaged, we may learn from thence how deſpicable they are.—For on this ſide modeſty is engaged, on that impudence; on this chaſtity, on that lewdneſs; on this integrity, on that fraud; on this piety, on that profaneneſs; on this conſtancy, on that fury; on this honour, on that baſeneſs; on this moderation, on that unbridled paſſion: In a word, equity, temperance, fortitude, prudence, and all virtues, contend with injuſtice, luxury, cowardice, raſhneſs, and all vices; plenty with want; reaſon with folly; ſobriety with madneſs; and, laſtly, good hope with deſpair. In ſuch a conteſt, did men deſert us, would not heaven ordain that ſo many and ſo great vices ſhould be defeated by theſe moſt excellent virtues?"

Gradation is another beautiful way of doing this. So when Cicero would aggravate the cruelty and barbarity of Verres for crucifying a Roman citizen, which was a ſort of puniſhment only inflicted upon ſlaves, he chooſes this way of doing it. "It is a crime (ſays he) to bind a Roman citizen, wickedneſs to whip him, and a ſort of parricide to kill him; what then muſt I call it to crucify him? No name can ſufficiently expreſs ſuch a villany." And the images of things may be thus heightened, either by aſcending, as in this inſtance; or deſcending, as in that which follows, relating to the ſame action of Verres: "Was I not to complain of or bewail theſe things to Roman citizens, nor the friends of our ſtate, nor thoſe who had heard of the Roman name; nay, if not to men, but beaſts; or, to go yet further, if in the moſt deſert wilderneſs, to ſtones and rocks; even all mute and inanimate creatures would be moved by ſo great and heinous cruelty."

And, to name no more, facts may be amplified from their circumſtances; as time, place, manner, event, and the like. But inſtances of this would carry us too far; and therefore we ſhall only add, that as the deſign of *amplification* is not barely to prove or evince the truth of things, but alſo to adorn and illuſtrate them, it requires a florid and beautiful ſtyle, conſiſting of ſtrong and emphatical words, flowing periods, harmonious numbers, lively tropes, and bright figures. But the conſideration of theſe things come under the Third Part of Oratory, upon which we are now to enter.

PART III. OF ELOCUTION.

ELOCUTION directs us to ſuit both the words and expreſſions of a diſcourſe to the nature of the ſubject, or to ſpeak with propriety and decency. This faculty is in one word called *eloquence*; and thoſe perſons who are poſſeſſed of it are therefore ſtyled *eloquent*.

Elocution is twofold, general and particular. The former treats of the ſeveral properties and ornaments of language in common; the latter conſiders them as they are made uſe of to form different ſorts of ſtyle.

I. GENERAL ELOCUTION.

41 General elocution defined.

THIS, according to rhetoricians, conſiſts of three parts; *Elegance*, *Compoſition*, and *Dignity*. A diſcourſe which has all theſe properties ſuitably adjuſted, muſt, with reſpect to the language, be perfect in its kind, and delightful to the hearers.

CHAP. I. *Of Elegance.*

ELEGANCE conſiſts in two things, *Purity* and *Perſpicuity*: And both theſe, as well with reſpect to ſingle words, as their conſtruction in ſentences. Theſe properties in language give it the name of *elegant*, for a like reaſon that we call other things ſo which are clean and neat in their kind. But in the common uſe of our tongue, we are apt to confound *elegance* with *eloquence*; and ſay, *a diſcourſe is elegant*, when we mean by the expreſſion, that it has all the properties of fine language.

§ 1. *Purity.*

42 Purity explained and illuſtrated.

BY this we are to underſtand the choice of ſuch words and phraſes as are ſuited and agreeable to the uſe of the language in which we ſpeak: And ſo grammarians reduce the faults they oppoſe to it to two ſorts, which they call *barbariſm* and *ſoleciſm*; the former of which reſpects ſingle words, and the latter their conſtruction. But we ſhall conſider them jointly, and in a manner different from grammarians; for with them all words are eſteemed pure which are once adopted into a language, and authoriſed by uſe. And as to phraſes, or forms of expreſſion, they allow them all the ſame claim, which are agreeable to the analogy of the tongue. But in oratory, neither all words nor all expreſſions are ſo called which occur in language; but ſuch only as come recommended by the authority of thoſe who ſpeak or write with accuracy and politeneſs. Indeed it is a common ſaying *that we ſhould think with the learned, and ſpeak with the vulgar*. But the meaning of that expreſſion is no more than that we ſhould ſpeak agreeably to the common uſage of the tongue, that every one may underſtand us; and not chooſe ſuch words or expreſſions as are either difficult to be underſtood, or may carry in them an appearance of affectation and ſingularity. But in order to ſet this matter in a clearer light, we ſhall here recount the principal things which vitiate the purity of language.

And firſt, it often happens, that ſuch words and forms of ſpeaking as were introduced by the learned are afterwards dropped by them as mean and ſordid, from a ſeeming baſeneſs contracted by vulgar uſe. For polite and elegant ſpeakers diſtinguiſh themſelves by their diſcourſe, as perſons of figure do by their garb; one being the dreſs of the mind, as the other is of the body. And hence it comes to paſs, that both have their different faſhions, which are often changed; and as the vulgar affect to imitate thoſe above them in both, this frequently occaſions an alteration when either becomes too trite and common. But beſide theſe ſordid words and expreſſions, which are rendered ſo by the uſe of the vulgar, there is another ſort firſt introduced by them, which is carefully to be avoided by all thoſe who are deſirous to ſpeak well. For the vulgar have their peculiar words and phraſes, ſuited to their circumſtances, and taken from ſuch things as uſually occur in their way of life. Thus in the old comedians, many things are ſpoken by ſervants, agreeable to their character, which would be

Elocution.

very unbecoming from the mouth of a gentleman. And we cannot but daily obſerve the like inſtances among ourſelves.

Again, this is common to language with all other human productions, that it is in its own nature liable to a conſtant change and alteration. For, as Horace has juſtly obſerved,

> All human works ſhall waſte;
> Then how can feeble words pretend to laſt?

Nothing could ever pleaſe all perſons, or at leaſt for any length of time. And there is nothing from which this can leſs be expected than language. For as the thoughts of men are exceedingly various, and words are the ſigns of their thoughts, they will be conſtantly inventing new ſigns, [illegible] them by, in order to convey their ideas with more clearneſs, or greater beauty. If we look into the different ages of the Latin writers, what great alterations and changes do we find in their language? How few now underſtand the remaining fragments of the *twelve tables*? Nay, how many words do we meet with even in Plautus, the meaning of which has not yet been fixed with certainty by the ſkill of the beſt critics? And if we conſider our own language, it will appear to have been in a manner entirely changed from what it was a few ages ſince. To mention no others, our celebrated Chaucer is to moſt perſons now almoſt unintelligible, and wants an expoſitor. And even ſince our own memory, we cannot but have obſerved, that many words and expreſſions, which a few years ago were in common uſe, are now in a manner laid aſide and antiquated; and that others have conſtantly ſucceeded, and daily do ſucceed, in their room. So true is that obſervation of the ſame poet:

> Some words that have or elſe will feel decay
> Shall be reſtor'd, and come again in play;
> And words now fam'd ſhall not be fancied long;
> They ſhall not pleaſe the ear, nor move the tongue:
> As uſe ſhall theſe approve, and thoſe condemn;
> Uſe, the ſole rule of ſpeech, and judge ſupreme.

We muſt therefore no leſs abſtain from antiquated or obſolete words and phraſes, than from ſordid ones. Though all old words are not to be thought antiquated. By the former we mean ſuch as, though of an ancient ſtanding, are not yet entirely diſuſed nor their ſignification loſt. And from the uſe of theſe we are not to be wholly debarred, eſpecially when they appear more ſignificant than any others we can fix upon. But as to phraſes or expreſſions, greater caution ſeems ſtill neceſſary: and ſuch as are old ſhould doubtleſs, if at all, be uſed more ſparingly. The Latin tongue was brought to its greateſt perfection in the reign of Auguſtus, or ſomewhat ſooner; and he himſelf ſtudied it very carefully For, as Suetonius tells us, "He applied himſelf to eloquence, and the ſtudy of the liberal arts, from his childhood, with great diligence and labour. He choſe a manner of ſpeaking which was ſmooth and elegant; he avoided the ill ſavour, as he uſed to call it, of antiquated words; and he was wont to blame Tiberius for his affectation of them." In our own language, ſuch words are to be eſteemed antiquated, which the moſt polite perſons have dropped, both in their diſcourſe and writings; whoſe example we ſhould follow, unleſs we would be thought to converſe rather with the dead than the living.

Elocution.

But further: As on the one hand we muſt avoid obſolete words and phraſes; ſo, on the other, we ſhould refrain from new ones, or ſuch whoſe uſe has not yet been ſufficiently eſtabliſhed, at leaſt among thoſe of the beſt taſte. Words may be conſidered as new in two reſpects; either when they are firſt brought into a language, or when they are uſed in a new ſenſe. As the former of theſe may ſometimes leave us in the dark by not being underſtood, ſo the latter are moſt apt to miſlead us; for when we hear a word that has been familiar to us, we are preſently led to fix that idea to it with which it has uſually been attended. And therefore, in both caſes, ſome previous intimation may be neceſſary. Cicero, who perhaps enlarged the furniture of the Roman tongue more than any one perſon beſides, appears always very cautious how he introduces any thing new, and generally gives notice of it when he attempts it, as appears in many inſtances ſcattered through his works. What bounds we are now to fix to the purity of the Latin tongue, in the uſe of it, the learned are not well agreed. It is certain, our furniture is much leſs than when it was a living language, and therefore the greater liberty muſt of neceſſity be ſometimes taken. So that their opinion ſeems not unadviſable, who direct us to make choice printipally of what we are furniſhed with from the writers of the Auguſtan age; and where we cannot be ſupplied from them, to make uſe of ſuch authors as lived neareſt to them, either before or ſince. And as to our own tongue, it is certainly prudent to be as careful how we admit any thing into it that is uncouth or diſagreeable to its genius, as the ancient Romans were into theirs; for the perfection of a language does in a great meaſure conſiſt in a certain analogy and harmony running through the whole, by which it may be capable of being brought to a ſtandard.

But beſides thoſe things already mentioned, any miſtake in the ſenſe of words, or their conſtruction, is oppoſed to purity. For to ſpeak purely, is to ſpeak correctly. And ſuch is the nature of theſe faults in elocution, that they are often not ſo eaſy to be obſerved by hearing as by reading. Whence it is, that many perſons are thought to ſpeak better than they write; for while they are ſpeaking, many ſlips and inaccuracies eſcape diſregarded, which in reading would preſently appear. And this is more eſpecially the caſe of perſons unacquainted with arts and literature; who, by the aſſiſtance of a lively fancy and flow of words, often ſpeak with great eaſe and freedom, and by that means pleaſe the ear; when, at the ſame time, what they ſay, would not ſo well bear reading.

We ſhall only add, that a diſtinction ought likewiſe to be made between a poetic diction and that of proſe writers. For poets in all languages have a ſort of peculiar dialect, and take greater liberties, not only in their figures, but alſo in their choice and diſpoſition of words; ſo that what is a beauty in them would often appear unnatural and affected in proſe.

§ 2. *Of Perſpicuity.*

43 Perſpicuity explained and illuſtrated.

Perspicuity, as well as *purity*, conſiſts partly in *ſingle words*, and partly in their *conſtruction*.

I. As

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As to ſingle words.

I. As to ſingle words, thoſe are generally cleareſt and beſt underſtood which are uſed in their proper ſenſe. But it requires no ſmall attention and ſkill [illegible] be well acquainted with the force and propriety of words; which ought to be duly regarded, ſince the perſpicuity of a diſcourſe depends ſo much upon it. Cæſar ſeems plainly to have been of this mind, when he tells us, "The foundation of eloquence conſiſts in the choice of words." It may not be amiſs, therefore, to lay down ſome few obſervations, by which the diſtinct notions of words and their peculiar force may more eaſily be perceived. All words may be divided into *proper words* and *tropes*. Thoſe are [illegible] *proper words*, which are expreſſed in their proper [illegible] ſenſe. And *tropes* are ſuch [illegible] ſome other thing than what t[illegible] reaſon of ſome ſimilitude, relation, or contrariety [illegible]tween the two things. So, when a ſubtle artful man is called a *fox*, the reaſon of the name is founded in a ſimilitude of qualities. If we ſay, *Cicero will always live*, meaning *his works*, the cauſe is transferred to the effect. And when we are told, *Cæſar conquered the Gauls*, we underſtand that he did it with the aſſiſtance of his army; where a part is put for the whole, from the relation between them. And when Cicero calls Antony *a fine guardian of the ſtate*, every one perceives he means the contrary. But the nature and uſe of tropes will be explained more fully hereafter in their proper place. All words muſt at firſt have had one original and primary ſignification, which, ſtrictly ſpeaking, may be called their *proper ſenſe*. But it ſometimes happens through length of time, that words loſe their original ſignification, and aſſume a new one, which then becomes their proper ſenſe. So *hoſtis* in the Latin tongue at firſt ſignified a *ſtranger*; but afterwards that ſenſe of the word was entirely laid aſide, and it was uſed to denote a *public enemy*. And in our language, it is well known, that the word *knave* anciently ſignified a *ſervant*. The reaſon of the change ſeems to be much the ſame, as in that of the Latin word *latro*; which firſt ſignified a *ſoldier*, but afterwards *a robber*. Beſides, in all languages it has frequently happened, that many words have gradually varied from their firſt ſenſe to others ſomewhat different; which, may, notwithſtanding, all of them, when rightly applied, be looked upon as proper. Nay, in proceſs of time, it is often difficult to ſay which is the original, or moſt proper ſenſe. Again, ſometimes two or more words may appear to have the ſame ſignification with each other, and may therefore be uſed indifferently; unleſs the beauty of the period, or ſome other particular reaſon, determine to the choice of one rather than another. Of this kind are the words *enſis* and *gladius* in the Latin tongue; and in ours, *pity* and *compaſſion*. And there are other words of ſo near an affinity to each other, or at leaſt appear ſo from vulgar uſe, that they are commonly thought to be ſynonymous. Such are the words *mercy* and *pity*; though mercy in its ſtrict ſenſe is exerciſed towards an offender, and pity reſpects one in diſtreſs. As this peculiar force and diſtinction of words is carefully to be attended to, ſo it may be known ſeveral ways. Thus the proper ſignification of ſubſtantives may be ſeen by their application to other ſubſtantives. As in the inſtance juſt now given, a perſon is ſaid to ſhow *mercy to a criminal*, and *pity to one in diſtreſs*. And in the like manner, verbs are diſtinguiſhed, by being joined to ſome certain nouns, and not to others. So a perſon is ſaid *to command an inferior*, *to intreat a ſuperior*, and *to deſire an equal*. Adjectives alſo, which denote the properties of things, have their ſignification determined by thoſe ſubjects to which they moſt properly relate. Thus we ſay, *an honeſt mind*, and *a healthful body*; *a wiſe man*, and *a fine houſe*. Another way of diſtinguiſhing the propriety of words, is by their uſe in gradations. As if one ſhould ſay, *Hatreds, grudges, quarrels, tumults, ſeditions, wars, ſpring from unbridled paſſions*. The proper ſenſe of words may likewiſe be [illegible]n by obſerving to what other words they are ei- [illegible] uſed as equivalent. So in that paſſage [illegible] "I cannot perceive why [illegible] with me: if it be becauſe I de- [illegible] why may not I be diſpleaſed with you for accuſing [illegible] whom I defend? You ſay, I accuſe my enemy; and I ſay, I defend my friend." Here the words *accuſe* and *defend*, *friend* and *enemy*, are oppoſed; and *to be angry* and *diſpleaſed*, are uſed as terms equivalent. Laſtly, the derivation of words contributes very much to determine their true meaning. Thus becauſe the word *manners* comes from the word *man*, it may properly be applied either to that or any other put for it. And therefore we ſay, *the manners of men*, and *the manners of the age*, becauſe the word *age* is there uſed for *the men of the age*. But if we apply the word *manners* to any other animal, it is a trope. By theſe and ſuch like obſervations we may perceive the proper ſenſe and peculiar force of words, either by their connection with other words, diſtinction from them, oppoſition to them, equivalency with them, or derivation. And by thus fixing their true and genuine ſignification, we ſhall eaſily ſee when they become tropes. But though words, when taken in their proper ſignification, generally convey the plaineſt and cleareſt ſenſe; yet ſome are more forcible, ſonorous, or beautiful, than others. And by theſe conſiderations we muſt often be determined in our choice of them. So whether we ſay, *he got*, or *he obtained*, *the victory*, the ſenſe is the ſame; but the latter is more full and ſonorous. In Latin, *timeo* ſignifies *I fear*; *pertimeo* is more full and ſignificant; and *pertimeſco* more ſonorous than either of the former. The Latin and Greek languages have much the advantage of ours in this reſpect, by reaſon of their compoſitions; by the help of which they can often expreſs that in one word for which we are obliged to put two words, and ſometimes more. So *pertimeo* cannot be fully expreſſed in our language by one word; but we are forced to join one or two particles to the verb, to convey its juſt idea, and ſay, *I greatly*, or *very much fear*: and yet even then we ſcarce ſeem to reach its full force. As to tropes, though generally ſpeaking they are not to be choſen where plainneſs and perſpicuity of expreſſion is only deſigned, and proper words may be found; yet through the penury of all languages, the uſe of them is often made neceſſary. And ſome of them, eſpecially metaphors, which are taken from the ſimilitude of things, may, when cuſtom has rendered them familiar, be conſidered as proper words, and uſed in their ſtead. Thus, whether we ſay, *I ſee your meaning*, or, *I underſtand your meaning*, the ſenſe is equally clear, though the latter expreſſion is proper, and the former metaphorical, by which the action of ſeeing is transferred from the eyes to the mind.

45
As to the conſtruction of ſentences.

II. But *perſpicuity* ariſes not only from a choice of *ſingle words*, but likewiſe from the *conſtruction* of them in ſentences. For the meaning of all the words in a ſentence, conſidered by themſelves, may be very plain and evident; and yet, by reaſon of a diſorderly placing them, or confuſion of the parts, the ſenſe of the whole may be very dark and obſcure. Now it is certain that the moſt natural order is the plaineſt; that is, when both the words and parts of a ſentence are ſo diſpoſed, as beſt agrees with their mutual relation and dependence upon each other. And where this is changed, as is uſually done, eſpecially in the ancient languages, for the greater beauty and harmony of the periods; yet due regard is had by the beſt writers to the evidence and perſpicuity of the expreſſion.

But to ſet this ſubject in a clearer light, on which the perfection of language ſo much depends, we ſhall mention ſome few things which chiefly occaſion obſcurity; and this either with reſpect to ſingle words, or their conſtruction.

And firſt, all ambiguity of expreſſion is one cauſe of obſcurity. This ſometimes ariſes from the different ſenſes in which a word is capable of being taken. So we are told, that upon Cicero's addreſſing himſelf to Octavius Cæſar, when he thought himſelf in danger from his reſentment, and reminding him of the many ſervices he had done him, Octavius replied, *He came the laſt of his friends*. But there was a deſigned ambiguity in the word *laſt*, as it might either reſpect the time of his coming, or the opinion he had of his friendſhip. And this uſe of ambiguous words we ſometimes meet with, not only in poetry, where the turn and wit of an epigram often reſts upon it; but likewiſe in proſe, either for pleaſantry or ridicule. Thus Cicero calls Sextus Clodius *the light of the ſenate*, which is a compliment he pays to ſeveral great men, who had diſtinguiſhed themſelves by their public ſervices to their country. But Sextus, who had a contrary character, was a relation of P. Clodius, whoſe dead body, after he had been killed by Milo, he carried in a tumultuous manner into the ſenate houſe, and there burnt it with the ſenators benches, in order to inflame the populace againſt Milo. And it is in alluſion to that riotous action, that Cicero, uſing this ambiguous expreſſion, calls him *the light of the ſenate*. In ſuch inſtances, therefore, it is a beauty, and not the fault we are cautioning againſt: as the ſame thing may be either good or bad, as it is differently applied.—Though even in ſuch deſigned ambiguities, where one ſenſe is aimed at, it ought to be ſufficiently plain, otherwiſe they loſe their intention. And in all ſerious diſcourſes they ought carefully to be avoided. But obſcurity more frequently ariſes from the ambiguous conſtruction of words, which renders it difficult to determine in what ſenſe they are to be taken. Quintilian gives us this example of it: "A certain man ordered in his will, that his heir ſhould erect for him a ſtatue holding a ſpear made of gold." A queſtion ariſes here, of great conſequence to the heir from the ambiguity of the expreſſion, whether the words *made of gold* are to be applied to the *ſtatue* or the *ſpear*; that is, whether it was the deſign of the teſtator by this appointment, that the whole ſtatue, or only the ſpear, ſhould be made of gold. A ſmall note of diſtinction, differently placed between the parts of this ſentence, would clear up the doubt, and determine the ſenſe either way. For if one comma be put after the word *ſtatue*, and another after *ſpear*, the words *made of gold* muſt be referred to the ſtatue, as if it had been ſaid, *a ſtatue, made of gold, holding a ſpear*. But if there be only the firſt comma placed after *ſtatue*, it will limit the words *made of gold* to the *ſpear* only; in the ſame ſenſe as if it had been ſaid, *A ſtatue holding a golden ſpear*. And either of theſe ways of expreſſion would in this caſe [illegible] preferable, for avoiding the ambiguity, according to the intention of the teſtator. The ancient heathen oracles were generally delivered in ſuch ambiguous terms. Which, without doubt, were ſo contrived on purpoſe, that thoſe who gave out the anſwers might have room left for an evaſion. See ORACLE.

Again, obſcurity is occaſioned either by too ſhort and conciſe a manner of ſpeaking, or by ſentences too long and prolix; either of theſe extremes have ſometimes this bad conſequence. We find an inſtance of the former in Pliny the Elder, where ſpeaking of hellebore, he ſays, "They forbid it to be given to aged perſons and children, and leſs to women than men." The verb is wanting in the latter part of the ſentence, *and leſs to women than men*: which in ſuch caſes being uſually ſupplied from what went before, would here ſtand thus; *and they forbid it to be given leſs to women than men*. But this is directly contrary to the ſenſe of the writer, whoſe meaning is, either that it is ordered to be given in a leſs quantity to women than men, or not ſo frequently to women as men. And therefore the word *order* is here to be ſupplied, which being of a contrary ſignification to *forbid*, expreſſed in the former part of the ſentence, occaſions the obſcurity. That long periods are often attended with the ſame ill effect, muſt be ſo obvious to every one's experience, that it would be entirely needleſs to produce any examples in order to evince the truth of it. And therefore we ſhall only obſerve, that the beſt way of preventing this ſeems to be by dividing ſuch ſentences as exceed a proper length into two or more; which may generally be done without much trouble.

Another cauſe of obſcurity, not inferior to any yet mentioned, is *parentheſis*, when it is either too long or too frequent. This of Cicero, in his oration for Sylla, is longer than we uſually find in him: "O immortal gods! (for I muſt attribute to you what is your own; nor indeed can I claim ſo much to my own abilities, as to have been able of myſelf to go through ſo many, ſo great, ſuch different affairs, with that expedition, in that boiſterous tempeſt of the ſtate), you inflamed my mind with a deſire to ſave my country." But where any obſcurity ariſes from ſuch ſentences, they may frequently be remedied by much the ſame means as was juſt now hinted concerning long and prolix periods; that is, by ſeparating the parentheſis from the reſt of the ſentence, and placing it either before or after. So in this ſentence of Cicero, the parentheſis may ſtand laſt, in the following manner:—"O immortal gods! you inflamed my mind with a deſire to ſave my country: for I muſt attribute to you what is your own; nor indeed can I claim ſo much to my own abilities, as to have been able of myſelf to go through ſo many, ſo great, ſuch different affairs, with that expedition, in that boiſterous tempeſt of the ſtate." This order of the ſentence is very plain, and leſs involved than the former.

Chap. II. *Of Compoſition.*

46 Compoſition defined and divided.

Composition, in the ſenſe it is here uſed, gives rules for the ſtructure of ſentences, with the ſeveral members, words, and ſyllables, of which they conſiſt, in ſuch a manner as may beſt contribute to the force, beauty, and evidence of the whole.

Compoſition conſiſts of four parts, which rhetoricians call *period*, *order*, *juncture*, and *number*. The firſt of theſe treats of the ſtructure of ſentences; the ſecond, of the parts of ſentences, which are words and members; and the two laſt, of the parts of words, which are letters and ſyllables. For all articulate ſounds, and even the moſt minute parts of language, come under the cognizance of oratory.

§ 1. *Of Period.*

47 Period defined and explained.

In every ſentence or propoſition, ſomething is ſaid of ſomething. That of which ſomething is ſaid, logicians call the *ſubject*, and that which is ſaid of it, the *predicate*: but in grammatical terms, the former is *a noun ſubſtantive of the nominative caſe*, and the latter *a finite verb*, denoting affirmation, and ſome ſtate of being, acting, or ſuffering. Theſe two parts may of themſelves conſtitute a ſentence: As when we ſay, *The ſun ſhines*, or *the clock ſtrikes*, the word *ſun* and *clock* are the ſubject in theſe expreſſions, *ſhines* and *ſtrikes* imply each the copula and predicate. Moſt commonly, however, the noun and the verb are accompanied with other words, which in grammatical conſtruction are ſaid either to be connected with or to depend upon them; but in a logical conſideration they denote ſome property or circumſtance relating to them. As in the following ſentence: *a good man loves virtue for itſelf.* The ſubject of this ſentence is *a good man*; and the predicate, or thing affirmed of him, that he *loves virtue for itſelf.* But the two principal or neceſſary words, on which all the reſt depend, are *man* and *loves*. Now a ſimple ſentence conſiſts of one ſuch noun and verb, with whatever elſe is joined to either or both of them. And a compound ſentence contains two or more of them; and may be divided into ſo many diſtinct propoſitions, as there are ſuch nouns and verbs, either expreſſed or underſtood. So in the following ſentence, *Compliance gains friends, but truth procures hatred*, there are two members, each of which contains in it an entire propoſition. For, *Compliance gains friends* is one complete ſentence, and *Truth procures hatred* is another; which are connected into one compound ſentence by the particle *but*. Moreover, it frequently happens, that compound ſentences are made up of ſuch parts or members, ſome if not all of which are themſelves compounded, and contain in them two or more ſimple members. Such is that of Salluſt: "Ambition has betrayed many perſons into deceit; to ſay one thing, and to mean another; to found friendſhip and enmity, not upon reaſon, but intereſt; and to be more careful to appear honeſt, than really to be ſo." This ſentence conſiſts of four members; the laſt of which three, conſiſting of oppoſite parts, are all compounded, as will appear by expreſſing them at length in the following manner; *Ambition has betrayed many perſons into deceit*; [that is, ambition] *has betrayed them to ſay one thing, and to mean another; it has betrayed them to found friendſhip and enmity, not upon reaſon, but intereſt; and it has betrayed them to be more careful to appear honeſt, than really to be ſo.* The three laſt of theſe members, beginning with the words *it betrays*, are all of them compounded, and conſiſt of two oppoſite members; which might each of them be expreſſed at length in the ſame manner, by ſupplying the ellipſis. As, *Ambition has betrayed many perſons to ſay one thing, and it has betrayed them to mean another.* And ſo of the reſt. From this inſtance we ſee how much is left to be ſupplied by the mind in all diſcourſe, which if expreſſed would both deſtroy its harmony and render it exceedingly tedious. But ſtill regard muſt be had to that which is omitted, ſo as to render what is ſaid conſiſtent with it; otherwiſe there can be no propriety in what is ſpoken. Nor can the members of a ſentence be diſtinguiſhed and duly ranged in their proper order, without this. But to proceed: Some ſentences conſiſt either wholly, or in part, of ſuch members as contain in them two or more compound ones, which may therefore, for diſtinction's ſake, be called *decompound members.*—Of this kind is that of Cicero, in his defence of Milo: "Great is the force of conſcience, great either way: that thoſe perſons are not afraid who have committed no offence; and thoſe who have offended always think puniſhment preſent before their eyes." The latter member of this ſentence, which begins with the word *that*, contains in it two compound members, which repreſent the different ſtate of mind between innocent and guilty perſons. And it is in the proper diſtinction and ſeparation of the members in ſuch complex ſentences that the art of pointing chiefly conſiſts. For the principal uſe of a comma is to divide the ſimple members, a ſemicolon the compound ones, a colon ſuch as are decompounded, and a period the whole from the following ſentence. We mention this the rather, to ſhow the different acceptation of theſe terms by grammarians, from that of the ancient writers upon oratory. For theſe latter apply them to the ſenſe, and not to any points of diſtinction. A very ſhort member, whether ſimple or compound, with them is a comma, and a longer a colon; for they have no ſuch term as a ſemicolon. Beſides, they call a very ſhort ſentence, whether ſimple or compound, a *comma*, and one of ſomewhat a greater length, a *colon*. And therefore if a perſon expreſſed himſelf either of theſe ways in any conſiderable number of ſentences together, he was ſaid to ſpeak by commas or colons. But a ſentence containing more words than will conſiſt with either of theſe terms, they call a ſimple period; the leaſt compound period with them requiring the length of two colons. However, this way of denominating ſentences, and the parts of them, rather from their length than the nature of them, appearing not ſo ſuitable, we have choſen rather to make uſe of the terms *ſimple* and *compound members*; and to call all thoſe *compound periods*, which contain two or more members, whether ſimple or compounded.

But to proceed: Sentences, with reſpect to their form or compoſition, are diſtinguiſhed into two ſorts, called by Cicero *tracta*, "ſtraight or direct;" and *contorta*, "bent or winding." By the former are meant thoſe whoſe members follow each other in a direct order, without any inflection; and by the latter, thoſe which ſtrictly ſpeaking are called *periods*. For περίοδος in Greek ſignifies a *circuit* or *circle*. And ſo the Latins call it *circuitus* and *ambitus*. By which both of them mean a ſentence conſiſting of correſpondent parts, ſo framed, that the voice in pronouncing them may have a proper elevation and cadency, and diſtinguiſh them by its inflection; and as the latter part returns back, and unites with the former, the period, like a circle, ſurrounds and incloſes the whole ſenſe. This elevation of the voice in the former part of the period, is by the Greeks called πρότασις, and by the Latins *propoſitio*; and the depreſſion of it in the latter part, by the one ἀπόδοσις, and by the other *redditio*.

Now as ſimple ſentences have not theſe correſpondent parts, which require any inflection of the voice; nor a circular form, by reaſon of their brevity; they are not properly periods, in the ſtrict ſenſe of the word: though, in common ſpeech, the words *ſentence* and *period* are often uſed as equivalent terms. Thus, if we ſay, *Generous minds are incited to the performance of noble exploits from motives of glory*; here is no diſtinction of parts, nor inflection of the voice in this ſentence. And indeed there is not any thing which relates to the ſtructure of theſe ſentences, but what will more properly be taken notice of in the ſecond part of *compoſition*, which is *order*.

And as to thoſe compound ſentences, whoſe members follow each other in a direct order, without any inflection, there is little art required in their compoſition. We ſhall produce one example of this kind from Cicero: "Natural reaſon inclines men to mutual converſe and ſociety; and implants in them a ſtrong affection for thoſe who ſpring from them; and excites them to form communities, and join in public aſſemblies; and, for theſe ends, to endeavour to procure both the neceſſaries and conveniencies of life; and that not for themſelves only, but likewiſe for their wives, children, and others who are dear to them, and have a right to their aſſiſtance." Here are five ſhort members in this ſentence, placed in a ſeries, without any inflection of the parts, or orbit of the whole. And as ſuch ſentences have no other boundary but the concluſion of the ſenſe, ſuited to the breath of the ſpeaker, he may either contract or lengthen them at pleaſure, without offending the ear. So, ſhould the ſentence laſt mentioned conclude with the firſt member in this manner, *Natural reaſon inclines men to mutual converſe and ſociety*; the ſenſe would be perfect, and the ear ſatisfied. The caſe would be the ſame at the end of the ſecond member, thus: *Natural reaſon inclines men to mutual converſe and ſociety, and implants in them a ſtrong affection for thoſe who ſpring from them.* And the like may be ſaid of the reſt. Since ſuch ſentences therefore may be thus limited at pleaſure, it ſeems more convenient both for the ſpeaker and hearers to confine them to a moderate length.

But becauſe the principal art relating to this part of compoſition lies in the frame and ſtructure of ſuch compound ſentences as are properly called *periods*, we ſhall treat upon theſe ſomewhat more largely. In the formation of theſe periods, two things are chiefly to be regarded; their *length* and *cadency*. As the length ought to be ſuited to the breath of the ſpeaker, the ancient rhetoricians ſcarce admit of more than four colons; by which we may here underſtand compound members of a moderate ſize, which will be generally found a ſuitable and [illegible]. For to extend them farther than the [illegible]age muſt be painful to the ſpeaker, and [illegible] unpleaſant to the hearers. As to the cadency, what Cicero has obſerved, is found true by experience, that the ears judge what is full and what is deficient; and direct us to fill up our periods, that nothing be wanting of what they expect. When the voice is raiſed at the beginning of a ſentence, they are in ſuſpence till it be finiſhed; and are pleaſed with a full and juſt cadency, but are ſenſible of any defect, and are diſpleaſed with redundancy. Therefore care muſt be taken that periods be neither deficient, and as it were maimed, that is, that they do not drop before their time, and defraud the ears of what ſeemed to be promiſed them; nor, on the other hand, offend them by too long and immoderate excurſions. This riſe and cadency of the voice in pronunciation, depend on the nature and ſituation of the members, as we ſhall endeavour to ſhow by particular inſtances; in the explication of which, by the word *members*, are to be underſtood ſuch as are uncompounded. In a period of two members, the turn of the voice begins with the latter member. Of this kind is the following ſentence of Cicero: "If impudence prevailed as much in the forum and courts of juſtice, as inſolence does in the country and places of leſs reſort; Aulus Cæcina would ſubmit as much to the impudence of Sextus Ebutius in this cauſe, as he did before to his inſolence when aſſaulted by him." Here the cadency begins at the words *Aulus Cæcina*. If a ſentence conſiſt of three members, the inflection is beſt made at the end of the ſecond member: for if it begin immediately after the firſt, the voice will be either apt to ſink too low, and not to be heard, before it reach the end; or elſe be precipitated, in order to prevent it. Cicero begins his oration for Milo with a ſentence of this form: "Although I fear, it may be a ſhame to be diſmayed at the entrance of my diſcourſe in defence of a moſt valiant man; and that it nowiſe becomes me, while Milo is more concerned for the ſafety of the ſtate than for himſelf, not to ſhow the ſame greatneſs of mind in his behalf: *yet* this new form of proſecution terrifies my eyes, which, whatever way they turn, want the ancient cuſtom of the forum, and former manner of trials." Here the cadency beginning at the third member with the word *yet*, makes a proper diviſion of the ſentence, and eaſy for the ſpeaker. But a period of four members is reckoned the moſt complete and perfect, where the inflection begins at the middle, that is, with the third member. Nor is it the ſame caſe here, as if, in a ſentence of three members, the cadency be made at the ſecond. For in proportion to the time of raiſing the voice may the ſpace be allowed for its ſinking. The following ſentence of Cicero gives us an inſtance of this, where he ſpeaks to his ſon: "Although, ſon Mark, having now been an hearer of Cratippus for a year, and this at Athens, you ought to abound in the precepts and doctrines of philoſophy, by reaſon of the great character both of your inſtructor and the city; one of which can furniſh you with knowledge, and the other with examples: yet, as I always to my advantage joined the Latin tongue with the Greek, and have done it not only in oratory, but likewiſe in philoſophy; I think you ought to do the ſame, that you may be equally converſant in both languages." The turn in this period begins at the word *yet*; which ſtanding near the middle, the voice is raiſed to that pitch in pronouncing the former part, as to admit of a gradual cadency, without being loſt before the concluſion of the ſentence. But where the ſenſe does not ſuit with this diviſion at the entrance upon the third member, it is beſt made at the fourth. Such is the following ſentence of Cicero: "If I have any genius, which I am ſenſible is very ſmall; or any readineſs in ſpeaking, wherein I do not deny but I have been much converſant; or any ſkill in oratory, from an acquaintance with the beſt arts, to which I confeſs I have been always inclined; *no one* has a better right to demand of me the fruit of all theſe things than this Aulus Læcinius." The cadency of this ſentence does not begin till the words *no one*; yet it ends handſomely, and without diſappointing the ear. Though indeed the three firſt members having each of them an inflection, check the elevation of the voice, and by that variety in the pronunciation add to the harmony of the ſentence. An equality of the members ſhould likewiſe be attended to in the compoſition of a period, the better to adjuſt their riſe and cadency. And for this reaſon, in ſentences of three members, where the cadency begins with the third; or in thoſe of four members, where it begins at the fourth; it promotes the harmony to make the laſt member longeſt. This is properly the nature of rhetorical periods, which when rightly formed have both an equal beauty and dignity in their compoſition.

But as all diſcourſe is made up of diſtinct ſentences, and whenever we expreſs our thoughts it is in ſome of the forms above-mentioned; ſo the uſe of them is not promiſcuous, but ſuited to anſwer different deſigns in ſpeaking. And in this view they are conſidered and made uſe of by the orator, as will be ſhown hereafter.

§ 2. *Of Order.*

48
Order defined and illuſtrated.

By *order*, rhetoricians mean the placing each word and member of a ſentence in ſuch a manner as will moſt contribute to the force, beauty, or evidence of the whole.

Order is of two kinds, *natural* and *artificial*. And each of theſe may be conſidered with reſpect to the parts either of ſimple or compound ſentences.

As to ſimple ſentences, we may call that order *natural*, when all the words in a ſentence are ſo placed, as they are connected with or follow each other in a grammatical conſtruction. And it may properly enough admit of this name, as it is founded in the nature of a propoſition, and the relation of the ſeveral words of which it conſiſts to each other. This we explained in the laſt chapter, and illuſtrated by proper examples; and ſhall therefore only give one inſtance of it here, to introduce the ſubject we are now upon. And it is this: *The fame of Iſocrates excited Ariſtotle to the profeſſion of oratory.* Here theſe words, *the fame of Iſocrates*, contain the ſubject of this ſentence, with what relates to it; and all thoſe which follow, *excited Ariſtotle to the profeſſion of oratory*, make up the predicate and its dependants. And in both parts each word grammatically conſidered ſtands in its proper order of conſtruction. And this ſeems agreeable to the natural way of conveying our thoughts, which leads us firſt to expreſs the ſubject or thing of which ſome other thing is ſaid, before the predicate or that which is ſaid concerning it; and with reſpect to both, as every idea ſucceeds another in the order of our conceptions, to range it in the ſame order when we communicate them to others. Our language in the general keeps pretty much to this method. But in one thing particularly it recedes from it; and that is, in placing adjectives, which denote the properties of things, before their ſubſtantives or ſubjects, whoſe properties they are: As when it is ſaid, *Evil communication corrupts good manners.* And this we always do, except ſomething follows which depends upon the adjective. So we ſay, *He was a man eminent for his virtue*: not *an eminent man*.

Artificial order, as it reſpects ſimple ſentences, has little or no regard to the natural conſtruction of words; but diſpoſes them in ſuch a manner as will be moſt agreeable to the ear, and beſt anſwer the deſign of the ſpeaker. The Latins take a much greater liberty in this reſpect than we do, or than the nature of our language will permit. Quintilian ſays, it is beſt for the verb to ſtand laſt, when there is no particular reaſon to the contrary. And he gives this reaſon for it, *becauſe the force of the ſentence lies in the verb*. So that, according to him, they ſeem to have had this view in putting the verb at the end; that as the whole ſentence is imperfect without the verb, the mind being thus held in ſuſpenſe might receive the deeper impreſſion from it at laſt. They likewiſe ſeparate ſuch words as have an immediate relation between them or dependence one upon another, and place any of them firſt or laſt as they pleaſe. In ſhort, their order ſeems in a manner arbitrary, if it does not break in upon perſpicuity, to which they uſually attend. But moſt of theſe things are unſuitable to the genius of our language. One might ſay indeed, *Convince him you cannot*: inſtead of ſaying, *You cannot convince him*: Or, *With my own eyes I ſaw it*; for, *I ſaw it with my own eyes*. And again: *In proportion to the increaſe of luxury the Roman ſtate declined*: for, *The Roman ſtate declined in proportion to the increaſe of luxury*. But this inverſion of words is proper in Engliſh compoſition only when it gives force to the expreſſion; as in the higher ſtyle it often does. It ſerves to impreſs known truths upon the mind, but is unfit for communicating the firſt principles of knowledge.

As to compound ſentences, that is, ſuch as conſiſt of two or more members, either ſimple or compounded; what relates to the words in each member ſeparately is the ſame as in ſimple ſentences. But with regard to the diſpoſition of the ſeveral members, that may be called the *natural order*, which ſo places them as they mutually depend on each other. Thus the antecedent member naturally precedes the relative; as in this expreſſion, *Men are apt to forgive themſelves what they blame in others*. In hypothetical ſentences the conditional member naturally ſtands firſt. Thus: *If Socrates be a rational creature, he is a man.* That member which expreſſes the effect of an action naturally comes laſt; as, *Though you offer ever ſo good reaſons, you will not prevail with him.* The like may be ſaid of time, with regard to things done in it; as, *The Roman eloquence ſoon declined when Cicero was dead.* And to name no more, the reaſon of a thing naturally follows that of which it is the reaſon; as thus: *All the pleaſures of life muſt be uncertain, ſince life itſelf is not ſecure.*

When this order is inverted, it may be ſtyled *artificial.* So to keep to the inſtances already given, the two members in the firſt ſentence may be thus inverted: *What they blame in others, men are apt to forgive themſelves.* In the ſecond, in this manner: *Socrates is a man, if he be a rational creature.* In the third, thus: *You will not prevail with him, though you offer ever ſo good reaſons.* And ſo in the reſt: As, *When Cicero was dead, the Roman eloquence ſoon declined*; and, *Since life itſelf is not ſecure, all the pleaſures of life muſt be uncertain.* The variety of inverſions in a ſentence may generally be greater or leſs in proportion to the number of its members. In the following ſentence of Cicero, the natural order ſeems to be this: *If that greatneſs of mind be void of juſtice, which ſhows itſelf in dangers and labours, it is blameable.* Which may be varied by changing the place of the firſt and third member, in the following manner: *That greatneſs of mind is blameable which ſhows itſelf in dangers and labours, if it want juſtice.* Or by altering the place of all the three members thus: *That greatneſs of mind is blameable, if it be void of juſtice, which ſhows itſelf in dangers and labours.* But oftentimes one member may be included in another, as in the inſtance here given: *If that greatneſs of mind, which ſhows itſelf in dangers and labours, be void of juſtice, it is blameable.* Here the relative member is included in the conditional, which is placed firſt, and the antecedent member follows both. But in Cicero it ſtands thus: *That greatneſs of mind, which ſhows itſelf in dangers and labours, if it want juſtice, is blameable*; where the relative and conditional members are both included in the antecedent member. The Latin tongue commonly admits of a much greater variety in the tranſpoſition of members, as well as in that of ſingle words, than ſuits with our idiom. In the following ſentence the natural order is much preferable, as it beſt ſuits with the proper elevation and cadency of the voice in its pronunciation: *I am willing to remit all that is paſt, provided it may be done with ſafety.* But ſhould we invert the members, and ſay, *Provided it may be done with ſafety, I am willing to remit all that is paſt*; the harmony of the cadency would be loſt. And if the latter member be included in the former, the alteration will ſtill be worſe; as, *I am willing, provided it may be done with ſafety, to forgive all that is paſt.* Here the inflection of the voice falls upon the ſame member as before, and deſtroys the beauty of the period by its elevation afterwards. Some ſentences admit of no involution of their members. Such are thoſe whoſe members are connected by conjunctive or disjunctive particles. As, *Virtue furniſhes the mind with the trueſt pleaſure in proſperity, and affords it the greateſt comfort in adverſity.* And, *A wiſe man is neither elated by proſperity, nor depreſſed by adverſity.* And the like may be ſaid of thoſe where the latter member begins with ſome illative or redditive particle. As in theſe inſtances: *The chief thing to be regarded in life is virtue, for all other things are vain and uncertain.* And, *Though fortune is always inconſtant, yet ſhe has many votaries.* Neither of the members in any of theſe ways of expreſſion, and ſome others which might be named, can be included one in the other. In all the examples hitherto given, the ſentences conſiſt only of ſimple members; and indeed compound members are not ſo often inverted, nor included one in another, by reaſon of their length. However, we ſhall here produce one inſtance of each: *Whoever conſiders the uncertainty of human affairs, and how frequently the greateſt hopes are fruſtrated; he will ſee juſt reaſon to be always on his guard, and not place too much dependence upon things ſo precarious.* This ſentence conſiſts of two compound members, which here ſtand in their natural order, but may be thus inverted: *He will ſee juſt reaſon to be always on his guard, and not place too much dependence on things ſo precarious; whoever conſiders the uncertainty of human affairs, and how often the greateſt hopes are fruſtrated.* In the following ſentence one compound member is included in another: *Let us not conclude while dangers are at a diſtance, and do not immediately approach us, that we are ſecure; unleſs we uſe all neceſſary precaution to prevent them.* Here the natural order would be: *While dangers are at a diſtance, and do not immediately approach us; let us not conclude, that we are ſecure, unleſs we uſe all neceſſary precaution to prevent them.*

But there are ſome other conſiderations relating to order, which, being taken from the nature of things, equally ſuit all languages. So, in amplifying, there ſhould be a conſtant gradation from a leſs to a greater; as when Cicero ſays, *Ambition creates hatred, ſhyneſs, diſcords, ſeditions, and wars.* On the contrary, in extenuating, we ſhould deſcend from a greater to a leſs; as if, ſpeaking of the ancient laws of Rome, one ſhould ſay, *They were ſo far from ſuffering a Roman citizen to be put to death, that they would not allow him to be whipt, or even to be bound.* In conſtituting any whole, we put the parts firſt; as, *Invention, diſpoſition, elocution, and pronunciation, make up the art of oratory.* But in ſeparating any whole, the parts follow: as, *The art of oratory may be divided into theſe four parts; invention, diſpoſition, elocution, and pronunciation.* In every enumeration care muſt be taken not to mix the whole with the parts; but if it be mentioned at all, it muſt either be put firſt or laſt. So it would be wrong to ſay, *He was a man of the greateſt prudence, virtue, juſtice, and modeſty*: for the word *virtue* here contains in it the other three, and therefore ſhould not be inſerted among them. See LANGUAGE, n° 17.

§ 3. *Of Juncture and Number.*

QUINTILIAN, ſpeaking of compoſition, repreſents a diſcourſe as very happy in that reſpect, when the *order, juncture,* and *number,* are all juſt and proper. The firſt of theſe, which gives rules for the due placing of the words and members of a ſentence, has been already explained. We now proceed to the other two, which relate to letters and ſyllables; the former treating of their connection, and the latter of their quantity.

49 The nature and uſe of *juncture* explained and illuſtrated.

I. As to *juncture*. A due attention is to be paid to the nature of the vowels, conſonants, and ſyllables in the connection of words, with regard to the ſound.

As to the *firſt*, when a word ends with a vowel, and the next begins either with a different vowel, or the ſame repeated, it uſually renders the pronunciation hollow and unpleaſant. For, as Quintilian has juſtly obſerved, "This makes a chaſm in the ſentence, and ſtops the courſe of it." For there muſt be ſome pauſe, in order to pronounce them both, or otherwiſe the ſound of one will be loſt. So, for inſtance, in pronouncing theſe words, *the other day*, unleſs you ſtop a little after the word *the*, the ſound of *e* will not be heard; and if it is dropt, it will occaſion a rougher ſound, from the aſpiration of *th* twice repeated ſo near together, as *th'other day*. Therefore to prevent both theſe inconveniences, we uſually ſay, *t'other day*. But the different conſonants, which together with the vowels make up thoſe ſyllables, often cauſe a conſiderable difference in the pronunciation, ſo as to render it more or leſs agreeable. As, if we ſay, *he overdid it*, the words *he over* have not ſo harſh a ſound as *the other*; though ſtill they require ſome pauſe to keep them diſtinct. Beſides, ſome vowels meet more amicably, and admit of a ſofter pronunciation, than others. Thoſe which have the weakeſt and ſmalleſt ſound, follow beſt; becauſe they occaſion the leaſt alteration of the organ in forming the two ſounds. Such are *e* and *i*; and therefore, without any chaſm in the ſound, or heſitation of the voice, we ſay *he is*. But where the action of the organs is greater, and the ſound ſtronger, the pronunciation is more difficult: as when we ſay, *tho' all*. For here is a contrary motion of the lips, which are firſt put forward in ſounding the *o*, and then drawn backward to pronounce the *a*; and therefore the ſound is much ſofter to ſay, *tho' every*, where their action is leſs. And the like ill effect commonly happens from the repetition of the ſame vowel: as if we ſay, *go on*; or, *uſually act thus*. There is a conſiderable difference between theſe two expreſſions, in repeating the ſound of the vowel, and where either of them is doubled in a ſingle word. For then the ſame ſound only is protracted by one continued motion of the organ; as in the words *good*, and *deem*. But here the ſound is repeated again by a new action of the organ; which, if precipitated, obſcures the ſound of one of the vowels; and, if too much retarded, makes a chaſm in the pronunciation; either of which is unpleaſant to the ear.

But as the coalition of two vowels occaſions an hollow and obſcure ſound, ſo the meeting of ſome conſonants renders it very harſh and rough. Thus the words *king Xerxes*, and *public good*, when ſo placed have not only a roughneſs, but likewiſe a difficulty in their pronunciation, from the contrary action of the lips; which in the former are firſt drawn back aed then forwards, but in the latter the contrary way, and in both of them with ſome conſiderable force. But this may very eaſily be avoided, by ſaying, with a little alteration in the words, *Xerxes the king*, and *the good of the public*. So likewiſe the words *ill company*, have a ſofter ſound than *bad company*, for the ſame reaſon. To multiply inſtances of this kind ſeems unneceſſary, which ſo frequently occur in all diſcourſes.

The repetition of the ſame ſyllable at the end and beginning of words, is the laſt thing to be conſidered. And a little obſervation will convince us, that where this happens, it generally renders the ſound either confuſed or unpleaſant. Cicero was often rallied on account of this verſe:

O fortunatam natam me conſule Romam.

Every one will eaſily perceive a diſagreeable ſound in the following expreſſion: "A man many times does that unadviſedly, of which he afterwards repents." The chime of the words *man many* both ſeems affected, and diſpleaſes the ear. But this will ſoon be remedied, if we ſeparate theſe two words, and ſay, "A man does that many times unadviſedly."

From the ſhort account here given of this part of compoſition, it is eaſy to perceive what things are neceſſary to render it moſt complete and accurate; which are theſe following. If a word end with a vowel, the next ought to begin with a conſonant, or ſuch a vowel whoſe ſound may agree well with the former. But if a word conclude with a conſonant, either a vowel ſhould follow, or ſuch a conſonant whoſe pronunciation will ſuit with it. And laſtly, the ſame ſyllable ought not to be repeated at the end of one word, and the beginning of the next. It has been obſerved by ſome critics, that the following verſe at the beginning of Virgil's Æneid has all theſe properties:

Arma virumque cano, Trojæ qui primus ab oris.

Where any word in this verſe ends with a vowel, the next begins with a conſonant; and where any one ends with a conſonant, the next begins with a vowel; and there is no repetition of the ſame ſound throughout the whole. But this is what rarely happens, eſpecially in our language, which abounds with conſonants. And what Quintilian ſays of the coalition of vowels, in treating upon this ſubject, ſeems applicable to the whole. "This (ſays he) is a thing not much to be dreaded; and I know not whether the neglect of it, or too great a concern about it, be worſe. It neceſſarily checks the vigour of the mind, and diverts it from matters of greater importance. And therefore, as it ſhows negligence to permit it, ſo to be in conſtant fear of it diſcovers a low genius." This was the opinion of that judicious writer. And as theſe things cannot always be attended to, it may be ſufficient to avoid them, where they prove very offenſive to the ear, and it may be done without ſome greater inconvenience. So in this ſentence, *Honeſty is the beſt policy*, the coalition of *t* and *p* in the two laſt words *beſt policy* produces a roughneſs in their pronunciation; but as the expreſſion is ſtrong, and cannot perhaps be well altered for the better, the ſound here ought to give way to the ſenſe.

50 The nature and uſe of number.

II *Number*. This reſpects the quantity of ſyllables, as *Juncture* does their quality. In the Greek and Roman languages every ſyllable has its diſtinct quantity; and is either long, ſhort, or common: two or more of which joined together in a certain order make a foot, and a determinate number of theſe in a different order conſtitute their ſeveral ſorts of metre. This variety of ſounds gives a much greater harmony to their poetry, than what can ariſe only from the ſeat of the accent, and the ſimilitude of ſound at the end of two verſes, which chiefly regulate our metre. And although their proſe was not ſo confined with regard to the feet, either as to the kind or place of them, as their metrical compoſitions; yet it had a ſort of meaſure, more eſpecially in the riſe and cadency of their periods. This they call *rhetorical number*. And accordingly the ancient writers upon this art acquaint us what feet are beſt ſuited to the beginning, middle, or concluſion of a ſentence. Such rules are not applicable to our language, which has not that accurate diſtinction of quantity in its ſyllables. For we are apt to confound accent with quantity, and pronounce thoſe ſyllables longeſt on which we lay the accent, though in their nature they are not ſo. As in the word *ádmirable*, where none but the firſt ſyllable *ad* is pronounced long; though that is only rendered ſo by poſition, and the two following are ſo by nature. And again, in the word *ávarice*, we ſound the firſt *a* long for the ſame reaſon, and the ſecond ſhort; contrary to the nature of both theſe vowels. However, we ſhall offer a few things that may be of ſome uſe to modulate our periods and adjuſt their cadency.

A great number of monoſyllables do not ſtand well together. For as there ought to be a greater diſtance in the pronunciation between one word and another, than between the ſyllables of the ſame word; ſuch pauſes, though ſhort, yet, when too frequent, make the ſound rough and uneven, and by that means ſpoil its harmony. And this may ſeem more neceſſary to be attended to, becauſe the Engliſh language abounds ſo much with monyſyllables. On the contrary, a continuation of many long words makes a ſentence move too ſlow and heavily. And therefore ſuch periods generally run beſt, which have a proper mixture of words of a different length. Beſides, as every word has its accent, which with us ſtands for quantity, a number either of monoſyllables, or long words, coming together, ſo far abates the harmony, as it leſſens the variety.

Again, ſeveral words of the ſame ending do not ſtand well together, eſpecially where the accent falls upon the ſame ſyllable in each of them. For this creates too great a jingle by the ſimilitude of ſound; and is apt to diſpleaſe, from an appearance of affectation. Of this kind is the following ſentence: *Nothing is more wélcome, delíghtſome, or whóleſome, than reſt to a wearied man.* In ſuch expreſſions therefore, if the order of the words cannot well be altered, ſome other word ſhould be ſubſtituted in the room of one of them at leaſt, to diverſify the ſound. So in the example here given, the ſound might be varied by ſaying, *Nothing is more wélcome, pleáſant, or whóleſome.*

But to add no more, if a ſentence end with a monoſyllable, it is apt to hurt the cadency, and diſappoint the ear; whereas words of a moderate length carry a greater force with them, by the fulneſs of their ſound, and afford the ear what it expected. And there is one ſort of monoſyllables more eſpecially, which never ſtand well at the concluſion of a period, though we frequently find them there; and theſe are the ſigns of caſes. Thus we ſay, *Avarice is a crime, which wiſe men are too often guilty óf.* But the cadency would doubtleſs be more agreeable if it was altered thus: *Avarice is a crime, of which wiſe men are too often gúilty.* Every one muſt perceive, when the accent falls upon the laſt ſyllable in the ſentence, as it does if it end with *óf*, the ſound is not ſo pleaſant as when it reſts upon the preceding ſyllable in the word *gúilty*. Nor are very long words well ſuited either to the beginning or concluſion of a period; for they retard the pronunciation at firſt, and fall too heavy at the end.

Chap. III. *Of Dignity.*

51 The neceſſity of dignity in an oration.

Dignity conſiſts in the right uſe of tropes and figures. It is not ſufficient for an orator to expreſs himſelf with propriety and clearneſs, or in ſmooth and harmonious periods; but his language muſt likewiſe be ſuited to the nature and importance of the ſubject. And therefore, as *elegance* gives rules for the firſt of theſe, and *compoſition* for the ſecond; ſo does *dignity* for the laſt of them. It is very evident, that different ſubjects require a different ſtyle and manner of expreſſion; ſince, as Quintilian ſays, "What is magnificent in one diſcourſe would be turgid in another; and thoſe expreſſions which appear low upon a ſublime ſubject, would ſuit leſſer matters: and as in a florid harangue a mean word is remarkable, and like a blemiſh; ſo any thing lofty and bright upon a trivial argument is diſproportionate, and like a tumour upon an even ſurface." Now this variety in the manner of expreſſion ariſes in a great meaſure from *tropes* and *figures*, which not only enliven and beautify a diſcourſe, but give it likewiſe force and grandeur; for which reaſon this part of elocution ſeems to have been called *dignity*.

Tropes and figures are diſtinguiſhed from each other in ſeveral reſpects. Tropes moſtly affect ſingle words, but figures whole ſentences. A trope conveys two ideas to the mind by means of one word; but a figure throws the ſentence into a different form from the common and uſual manner of expreſſion. Beſides, tropes are chiefly deſigned to repreſent our thoughts, but figures our paſſions.

§ 1. *Tropes.*

52 Tropes, what.

A *trope*, which is a figure of words, has been uſually defined to be *the change of a word from its proper ſignification to ſome other with advantage, either as to beauty or ſtrength.* The words, *with advantage*, are added in the definition, becauſe a trope ought not to be choſen, unleſs there is ſome good reaſon for uſing it rather than the proper word. But in what manner, or how far, it can be ſaid of all tropes in general, that they change the proper ſignification of words, will beſt appear by conſidering the nature of each kind of them ſeparately. Now in every trope a reference is had to two things, which occaſions two ideas; one of the thing expreſſed, and another of that thing to which it has a reſpect, and is ſupplied by the mind. For all tropes are taken either from things internally related, as the whole and a part; or externally, as cauſe and effect, ſubject and adjunct; or from ſome ſimilitude that is found between them; or from a contrariety. The firſt of theſe is called *ſynecdoche*, the ſecond *metonymy*, the third *metaphor*, and the laſt *irony*. We ſhall endeavour to illuſtrate this by examples. When we ſay, *Hannibal beat the Romans*; the meaning is, that Hannibal and his army did this. So that although in ſome ſenſe a part may here be ſaid to ſtand for the whole, which makes it a *ſynecdoche*; yet, ſtrictly ſpeaking, the word *Hannibal* does not alter its ſenſe, but there is an ellipſis in the expreſſion, Hannibal being put for himſelf and his army. But if we ſay, *Cicero ſhould be read by all lovers of eloquence*; here indeed the word *Cicero* appears to be changed from its proper ſenſe, and to ſignify the books of Cicero; which is a *metonymy*, the author being put for his works; and therefore ſuch expreſſions need not be deemed elliptical. Again, if any one, ſpeaking of a ſubtle and crafty man, ſhould ſay *he is a fox*; the meaning is, he is like a fox; which is a *metaphor*; where the word *fox* retains its proper ſenſe, and denotes that animal, to which the man is compared on account of his craft. Laſtly, if a perſon ſay to another, *Well done*; meaning that the thing was ill done, the word *well* keeps its own ſenſe; but from the manner of its pronunciation, or ſome other circumſtance attending the expreſſion, it will be evident that the contrary is intended; which is called an *irony*. From theſe inſtances it may appear in what latitude we muſt underſtand the common definition of a trope, which makes it to conſiſt in the change of a word from its proper ſenſe into ſome other. But though in reality there are but four kinds of tropes, which are diſtinguiſhed by ſo many different reſpects which things bear one to another; yet as theſe ſeveral reſpects are found in a variety of ſubjects, and attended with different circumſtances, the names of *tropes* have from hence been greatly multiplied; which, however, may all be referred to ſome or other of thoſe already mentioned, as will be ſhown when we come to treat of them in their order. And for diſtinction ſake we ſhall call the former *primary*, and the latter *ſecondary*, *tropes*.

We now proceed to conſider the reaſons which have occaſioned the introduction of tropes. And theſe, as Quintilian obſerves, are three; *neceſſity*, *emphaſis*, and *beauty*.

53
Why introduced

1. Tropes were firſt introduced from *neceſſity*, deriving their origin unqueſtionably in a conſiderable degree from the barrenneſs of language, becauſe no language which we know contains a ſufficient number of proper words to expreſs all the different conceptions of our minds: but the principal cauſe of their introduction ſeems to be that extenſive influence which imagination poſſeſſes over every kind of ſpeech. The mind conſiders the ſame thing various ways; views it in different lights; compares it with other things; and obſerves their ſeveral relations and affections; wherein they agree, and in what they differ. From all which reflections it is furniſhed with almoſt an infinite number of ideas; which cannot all of them be diſtinguiſhed and expreſſed by proper words, ſince new ones occur daily. And were this poſſible, yet would it be impracticable, becauſe the multitude of words muſt be ſo vaſtly great that the memory could not retain them, nor be able to recal them as occaſion required. Tropes have in a good meaſure redreſſed both theſe inconveniences; for by means of them the mind is not burdened with a numberleſs ſtock of different words, and yet nothing ſeems to want a name. Thus ſometimes where a word is wanting to expreſs any particular thing, it is clearly enough repreſented by the name of ſome other thing, by reaſon of the ſimilitude between them. At other times, the cauſe is ſignified by the effect, the ſubject by the adjunct; or the contrary. And the whole is often underſtood by a part, or a part by the whole. And thus by the uſe of tropes the mind is helped to conceive of ſomething not expreſſed, from that which is expreſſed. It is much the ſame caſe, as when we have occaſion to ſpeak of a perſon, whoſe name we are either unacquainted with, or have forgot; for by deſcribing his perſon, abode, or ſome other circumſtances relating to him, those we converſe with as well underſtand whom we mean, as if we mentioned his name. So the ſhepherd in Virgil, when he could not think of the name of Archimedes, deſcribes him by his works:

> And what's his name who form'd the ſphere,
> And ſhow'd the ſeaſons of the ſliding year?

Beſides, it ſometimes happens in a diſcourſe, that thoſe things are neceſſary to be ſaid, which, if expreſſed in their proper terms, would be offenſive; but being clothed with metaphors, may be conveyed to the mind with decency. Thus then the imagination never contemplates any one idea ſingle and alone, but always along with other ideas, which may be called its *acceſſories*, and which often operate more forcibly upon the mind than the principal idea itſelf does. In their nature they are often more agreeable, and frequently alſo more familiar, to our conceptions; or perhaps they remind us of a greater variety of important circumſtances. Hence the name of the acceſſory is often preferred, as, *e. g.* when we want to point out the time in which a ſtate enjoyed its chief reputation, &c. the proper words might do, but the imagination ſuggeſts the flouriſhing period of a plant or tree; and we ſay "the Roman empire flouriſhed moſt under Auguſtus:" Catiline, we ſay, was the *head* inſtead of the *leader* of his party, becauſe the head is the principal part of the human figure.

2. A ſecond reaſon above mentioned for the uſe of tropes was *emphaſis*. Tropes do many times expreſs things with greater force and evidence than can be done by proper words. We receive much the greater part of our knowledge by our ſenſes. And ſimilitudes taken from ſenſible things, as in metaphors, very much aſſiſt the mind in its reflections upon thoſe things which do not come under the cognizance of the ſenſes. For it is certain, that we are ſooner and more ſtrongly affected with ſenſible objects, than with things of which we can have no ideas but from the internal operations of our own minds. Nay, ſometimes one bright and lively trope ſhall convey a fuller and more juſt idea of a thing than a large pariphraſis. So when Virgil calls the Scipios *two thunderbolts of war*, he gives a more lively image of the rapid force and ſpeedy ſucceſs of their arms, than could have been conveyed by a long deſcription in plain words. And in many caſes the tropical uſe of words is ſo emphatical, and ſuited to the idea we deſign to excite, that in this reſpect it

may be juſtly eſteemed the moſt proper. So, *incenſed with anger, inflamed with deſire, fallen into an error*, are all metaphorical expreſſions, uſed in a way of ſimilitude; and yet perhaps no proper words can be made uſe of, which will convey a more lively image of the thing we deſign to repreſent by them.

But *beauty* and ornament, as was obſerved before, have been another cauſe of the uſe of tropes. Some ſubjects require a more florid and elegant dreſs than others. When we deſcribe or applaud, ornaments of ſpeech and a gaiety of expreſſion are requiſite. And it is the buſineſs of an orator to entertain his hearers at the ſame time that he inſtructs them. Now Cicero, who was an admirable judge of the force and power of eloquence, has obſerved, that tropical expreſſions give the mind the greateſt delight and entertainment. "I have often wondered (ſays he) why tropes ſhould give greater pleaſure than proper words. I imagine the reaſon muſt be, either that there is an appearance of wit in neglecting what is at hand, and making choice of ſomething at a diſtance; or that the hearer is furniſhed with a different thought, without being led into a miſtake, which affords a very agreeable pleaſure: or that a whole ſimilitude is conveyed to the mind by a ſingle word; or that, particularly in the beſt and moſt lively metaphor, the image is preſented to our ſight, which is the quickeſt of our ſenſes." And therefore he ſuppoſes, that "as garments were firſt invented from neceſſity, to ſecure us from the injuries of the weather, but improved afterwards for ornament and diſtinction; ſo the poverty of language firſt introduced tropes, which were afterwards increaſed for delight." Beſides, a variety of expreſſion is pleaſing in a diſcourſe. It is many times neceſſary that the ſame thing ſhould be repeated; and if this be done in the ſame words, it will grow tireſome to the hearers, and ſink their eſteem of the ſpeaker's ability. Therefore, to prevent this, it is proper the expreſſion ſhould be varied, that although the ſenſe be the ſame, it may give the mind a new pleaſure by its different dreſs.

We come now, in the laſt place, to lay down ſome directions proper to be obſerved in the choice of tropes.

And firſt, as every trope gives us two ideas; one, of the word expreſſed; and another, which, by means of that, the mind connects with it; it is neceſſary, that the relation between theſe two appear very plain and evident. For an obſcure trope is always faulty, unleſs where ſome particular reaſon makes it neceſſary. And therefore tropes ought not to be too far-fetched, leſt that ſhould render them dark. For which reaſon Cicero ſays, he ſhould not chooſe to call any thing deſtructive to a perſon's fortune, *the Syrtis of his patrimony*, but rather the *rock of it*; nor the *Charibdis of his eſtate*, but the *gulph of it*. For thoſe who either did not know that the Syrtes were two quickſands upon the coaſt of Africa, or that Charibdis was a gulph in the ſtrait of Sicily, both of them very deſtructive to mariners, would be at a loſs to underſtand the meaning of the metaphor. Beſides, metaphors taken from things we have ſeen, affect the mind more forcibly than thoſe which are taken from ſuch things as we have only heard of. Now there is ſcarce any one who has not ſeen a rock or a gulph; but there are very few perſons, comparatively, who have been either at Charibdis or the Syrtes." It is neceſſary therefore in a good trope, not only that there be a near affinity between the two ideas, but likewiſe that this affinity be very obvious and generally known, ſo that the word be no ſooner pronounced but both images do immediately preſent themſelves to the mind.

Again, as a trope ought to be very plain and evident, ſo likewiſe ſhould it bear a due proportion to the thing it is deſigned to repreſent, ſo as neither to heighten nor diminiſh the juſt idea of it. Indeed, ſometimes when we ſpeak of things indefinitely, we ſay too much, leſt we ſhould ſeem to ſay too little. And this manner of ſpeaking is called an *hyperbole*; which is not uncommon in the ſacred writings. So, for inſtance, Saul and Jonathan are ſaid to be *ſwifter than eagles, and ſtronger than lions*. But even in this way of expreſſion a proportion is to be obſerved. For ſome very conſiderable and unuſual exceſs of the thing in its kind is at leaſt deſigned by it; which, perhaps, cannot, or however is not neceſſary to be defined. And therefore Quintilian blames Cato for calling the top of an hill a *wart*; becauſe the proportion between the two ideas is nowiſe adequate. And ſo on the contrary Ariſtotle cenſures Euripides for calling rowing *the empire of the oar*. Poets indeed are allowed a greater liberty in this reſpect; but an orator ſhould be modeſt in his expreſſions, and take care that he neither ſo heighten nor diminiſh the natural ideas of things by tropes, as to lead his hearers into miſtakes.

But further: as a moderate uſe of tropes, juſtly applied, beautifies and enlivens a diſcourſe; ſo an exceſs of them cauſes obſcurity, by running it into abſtruſe allegories and riddles. Tropes are not the common and ordinary dreſs of our thoughts, but a foreign habit: and therefore he who fills his diſcourſe with a continued ſeries of them, ſeems to act like one who appears in public in a ſtrange dreſs: which no man of character would chooſe to do.

Moreover, as one uſe of tropes is pleaſure and entertainment, we ſhould endeavour to make choice of ſuch as are ſmooth and eaſy. But if at any time we think it neceſſary to uſe a harſh trope, it is proper to ſoften it by ſome precaution. For, as Cicero very handſomely ſays, *a trope ſhould be modeſt, ſince it ſtands in a place which does not belong to it; for which reaſon it ſhould ſeem to come thither by permiſſion, and not by force.* And therefore when he thought it harſh to ſay, *The death of Cato made the ſenate an orphan*; he guards the expreſſion by ſaying, *The death of Cato has (if I may be allowed to ſay ſo) rendered the ſenate an orphan.*

And, to add no more, care ſhould be taken how we transfer tropes from one language into another. For as they are frequently taken not only from natural things, or ſuch notions as are common to the generality of mankind, but likewiſe from the manners, cuſtoms, and occurrences of particular nations; ſo they may be very plain and obvious to thoſe among whom they took their riſe, but altogether unintelligible to others who are unacquainted with the reaſon of them. It was cuſtomary for the Roman ſoldiers to carry their money in their girdles: hence it was the ſame thing with them to ſay, *a perſon had loſt his girdle*, as that *he had loſt his money*. And becauſe the Romans wore the *toga*, which was a long gown, in time of peace, and a different garb when engaged in war, their writers ſometimes uſe the word *toga* to ſignify peace. But as neither of theſe cuſtoms is in uſe among us, ſo neither would the tropes ſuit our language, or be generally underſtood by us. And even in ſuch tropes as are taken from the common nature of things, languages very much differ. There is a very beautiful trope in the account of St Paul's ſhipwreck, where it is ſaid, *The ſhip was caught, and could not bear up into the wind.* The original word, that we tranſlate *bear up,* is αντοφθαλμειν; and properly ſignifies, *to look or keep its eyes againſt it;* which is a very ſtrong and lively image, taken from animate beings, and when applied to men, often ſignifies *to withſtand* or *reſiſt:* αντοφθαλμειν πολεμιω, *to reſiſt an enemy;* and Plutarch ſays of Demoſthenes, that he could not αντοφθαλμειν τω αργυριω, *look againſt* or *reſiſt the power of money.* Nothing is more common with Latin writers, than to call men of a public ſpirit and true patriots, *lumina et ornamenta reipublicæ,* that is, *the lights and ornaments of the ſtate.* And we have borrowed from them the uſe of both theſe metaphors. But becauſe tropes and figures illuſtrate and heighten the ſtyle, they call them alſo, *lumina orationis,* or *the lights of a diſcourſe.* It ſometimes happens, that only the tropical ſenſe of a word is taken from one language into another, and not the proper ſignification of the ſame word. So *ſcrupulus* in Latin properly ſignifies *a little ſtone, which getting into the ſhoe hurts a perſon as he walks;* hence it is applied to the mind, and uſed to expreſs *a doubt, or uneaſy thought that gives it pain.* We have borrowed this latter ſenſe of the word, but not the former.

Art. I. Primary Tropes.

54 Metaphor, what.

I. *Metaphor.* A metaphor, as uſually defined, is, *A trope, which changes words from their proper ſignification to another different from it, by reaſon of ſome ſimilitude between them.* But that a word, when uſed metaphorically, does not alter its ſignification, but retains its proper ſenſe, was ſhown above. However, it may not be amiſs to explain this matter more fully, and ſet it in a clearer light. Every *metaphor,* then, is nothing elſe but a ſhort ſimilitude. Cicero calls it *a ſimilitude reduced to a ſingle word.* And Quintilian to the ſame purpoſe ſays, that "a metaphor is a ſhort ſimilitude, and differs from it only in this, that the former is compared to the thing we deſign to expreſs, and the latter is put for it. It is a ſimilitude, when I ſay of a man, he has acted like a lion; and a metaphor, when I ſay, he is a lion." Thus far Quintilian. Now in every ſimilitude three things are requiſite; two things that are compared together, and a third in which the ſimilitude or likeneſs between them conſiſts. And therefore, to keep to this example, when Horace calls a Roman ſoldier *a lion,* if the word *lion* did not retain its proper ſenſe, there could be no ſimilitude; becauſe there would not be two things to be compared together with reſpect to a third, which is neceſſary in every ſimilitude, and was deſigned by this expreſſion. The ſenſe of which is plainly this: *That as a lion ſeizes his prey with the greateſt fierceneſs, ſo a Roman ſoldier with like rage and fury attacked his enemies.* In the ſame manner, when Cicero calls Piſo *the vulture of the province,* his meaning is, that he was like a vulture, or acted in ſuch a manner as a vulture acts, that is, rapaciouſly. So that the real difference between a metaphor and a ſimilitude conſiſts in this; that a metaphor has not thoſe ſigns of compariſon which are expreſſed in a ſimilitude. But ſome perſons have run into miſtakes in reaſoning from tropes of this kind. For they have ſo argued from metaphorical words, as if all the affections and properties of the things expreſſed by them might be attributed to thoſe other things to which they are applied, and by that means have ſtrained the compariſon (which has uſually but one particular view), in order to make it tally in other reſpects, where there is not that ſimilitude of ideas. We will endeavour to make this evident by another example from Cicero, where he calls M. Antony *the torch of the ſtate.* The ſimilitude between Antony and a torch lay in this: *That as a torch burns and deſtroys every thing within its reach, ſo Antony brought devaſtation and ruin wherever he came.* Now a torch has not only a property to burn, but alſo to give light; but the ſimilitude would not hold in this reſpect, nor was it at all deſigned. For Cicero never calls a wicked profligate man, as Antony was, *the light of the ſtate;* though he often gives that character to good and virtuous men, who by their examples do as it were enlighten others, and ſhow them the way to be happy themſelves and uſeful to others. But though metaphors are uſually taken from a ſimilitude between two things, as in the inſtances here mentioned; yet ſometimes they are founded in the ſimilitude which two things bear to two others in ſome particular reſpect, by means whereof what properly belongs to one of them is transferred to the other: the former of which are called *ſimple metaphors,* and the latter *analogous.* Hence the rudder of a ſhip may be called its *reins;* for what the reins are to a horſe, that the rudder is to a ſhip in guiding and directing it. So that here is a double ſimilitude, one between a ſhip and an horſe, and another between the rudder of the former and the reins of the latter; and from the analogy between the uſe of the rudder to the one and reins to the other, the reins, which belong properly to the horſe, are applied to the ſhip. Again, ſome metaphors are reciprocal, in which the ſimilitude holds either way. Thus to ſteer and to govern are uſed reciprocally both of a ſhip and a ſtate: the proper expreſſions being, *to ſteer a ſhip, and govern a ſtate;* and the contrary metaphorical. But though we ſay, *the foot of a mountain,* borrowing the ſimilitude from animals; yet we do not ſay, on the contrary, *the bottom of an animal,* meaning his feet; and therefore that metaphor is not reciprocal. From this account therefore of the nature of a metaphor, it may be ſaid to be, *The application of a word by way of ſimilitude to ſome other thing than what it properly ſignifies.* And the plainer this ſimilitude appears, the greater beauty there is in the trope.

The uſe of metaphors is very extenſive, as large as univerſal nature. For there are ſcarce any two things which have not ſome ſimilitude between them. However, they may all be reduced to four kinds; which was the ſecond thing propoſed to be conſidered.

The firſt kind of metaphors therefore may be taken from ſimilitudes between animate beings. As where thoſe things, which properly relate to brutes, are accommodated to men; or thoſe which belong to men are applied to brutes. Of the former ſort is that joke of Cicero: *My brother being aſked by Philip, why he barked*

barked ſo? anſwered, *Becauſe he ſaw a thief.* Here *barking*, the property of a dog, is applied to a man: And the reply does not ſeem to carry more ſeverity or harſhneſs with it than the queſtion. By the latter ſort we ſay, *a crafty fox*, and *a generous horſe;* which are affections that properly relate to men. And to this kind of metaphors may thoſe likewiſe be referred, when that which properly belongs to the ſenſes is applied to the mind. Thus we often ſay, *that we ſee a thing*, when we mean *that we underſtand* or *apprehend it.* And in the ſame ſenſe we ſay, *that we hear ſuch a thing*, or *perſon.* And by the like manner of expreſſion, a perſon is ſaid *to ſmell out a thing.* And thoſe who have a genius or diſpoſition for any art or ſcience, are ſaid *to have a taſte for it;* and ſuch as have entered upon the ſtudy of it, are ſaid *to have a touch of it.* Theſe are common ways of ſpeaking in moſt languages, and very expreſſive of what is intended by them And we may alſo bring thoſe metaphors under this head, by which the properties and affections of men are attributed to the Deity: as, when God is ſaid *to hear, ſee, be angry, repent*, and the like; which are forms of expreſſions very frequent in the ſacred writings.

A ſecond kind of metaphors lies between inanimate things, whether natural or artificial, which bear ſome ſimilitude to each other. And this head is very extenſive. Thus we ſay, *floods of fire*, and *clouds of ſmoke*, for large quantities. And ſo likewiſe, *to inflame an account*, that is, to heighten or increaſe it; with innumerable others of the like ſort. In the two firſt of theſe inſtances, the terms proper to one element are applied to another; and as thoſe elements of fire and water are oppoſite to each other, they ſhow the extenſiveneſs of this trope, that there are no things in nature ſo contrary, but may come within the limits of it, and be accommodated to each other in a way of ſimilitude. In the laſt example, a natural action is applied to what is artificial.

A third ſort of metaphors is, when inanimate things are applied to animals, on account of ſome like properties between them. Thus Homer calls Ajax, *the bulwark of the Greeks*, on account of his valour, which like a wall defended them from the Trojans. And [illegible] brand ill [illegible] for his great diſcernment and quick perception of things; fetching the alluſion from metals when brought to an edge or a point. As, on the contrary, old Chremes in Terence calls himſelf a *ſtone*, for want of apprehenſion. And we ſay, *a gay perſon*, and *a bright genius*, by this kind of metaphor.

The fourth and laſt kind of metaphors is that by which the actions and other attributes of animals are accommodated to inanimate things. Thus Cicero, ſpeaking of Clodius, ſays: "The very altars, when they ſaw that monſter fall, ſeemed to move themſelves and aſſert their right againſt him" Here the words *ſaw, move*, and *aſſert*, are all metaphors taken from the properties of animals. And Virgil, when he would repreſent the impetuous force and rapidity of the river Araxes, ſays, *it diſdained a bridge.* And it is a very uſual epithet, which Homer gives to words, to call them [illegible] or *winged*, to intimate the ſwiftneſs of ſpeech.

Laſtly, as to the choice of metaphors, thoſe are eſteemed the fineſt and ſtrongeſt, which *give life and action to inanimate things.* The reaſon of which is, becauſe they do as it were invigorate all nature, introduce new forms of beings, and repreſent their images to the ſight, which of all the ſenſes is the quickeſt, moſt active, and yet moſt unwearied. What can be more moving, or in ſtronger terms expreſs the villany of Clodius, than when Cicero ſays, "The very altars of the gods ſeemed to exult at his death." And the ſame great orator particularly commends thoſe metaphors, for their ſprightlineſs and vivacity, which are taken from the ſenſe of ſeeing; as when we ſay *a bright thought*, or *a gay expreſſion.*

However, care muſt be taken not to venture upon too bold and daring metaphors. Poets indeed claim greater liberty in this reſpect, whoſe view is often to amuſe, terrify, or delight, by heightening the juſt and natural images of things. But it is expected the orator ſhould reaſon coolly, though ſtrongly and forcibly; and not by theatrical repreſentations ſo tranſport the mind, as to take it off from reflection, unleſs perhaps on ſome particular occaſion. And yet, on the other hand, metaphors ought not to ſink below the dignity of what they are deſigned to expreſs; but the idea they convey ſhould at leaſt be equal to the proper word in the place of which they are ſubſtituted.

But there is a very great difference in the choice of metaphors, as they are deſigned either to praiſe or diſpraiſe. One thing may be compared to another in a great variety of reſpects. And the ſame thing may be made to appear either noble or baſe, virtuous or vicious, by conſidering it in a different light. Such metaphors, therefore, as are choſen to commend, muſt be taken from great and laudable things; and on the contrary, thoſe which are deſigned to diſcommend, from things vile and contemptible. Ariſtotle gives us a very pleaſant example of this in the poet Simonides. A certain perſon, who had carried the prize at a race of mules, offered him a reward to write a poem in honour of that action. Simonides thought he did not bid high enough: and therefore put him off with ſaying [illegible] and, as Ariſtotle obſerves, when he [illegible] ſpeak of the mules in that poem, he does not mention them by that name, but calls them *the daughters of fleet and generous horſes*, though he might with as much propriety have called them *the daughters of dull aſſes.* But it was the poet's buſineſs, in praiſing, to take the moſt advantageous part of the character. Where things are capable of ſuch different turns, metaphorical expreſſions are generally moſt beautiful. And ſometimes the ſame metaphor may be applied contrary ways, both in praiſe and diſpraiſe, as it will ſuit different properties of the thing to which it refers. So a *dove*, in a metaphorical ſenſe, may repreſent either *innocence* or *fear;* and an *iron heart* may denote either *courage* or *cruelty;* as an *hard head*, *ſtrength* or *weakneſs of thought.* And this ambiguity in the application of metaphorical words often affords occaſion for jeſts and conciſe wit. We obſerved before, that Cicero never calls ill men, *lights of the ſtate*. But he once in this manner calls Sextius Clodius *the light of the ſenate*. For when his kinſman Publius Clodius had been killed by Milo, and his corpſe was brought to Rome, Sextius raiſed the mob, and in a tumultuous manner carried it into the ſenate-houſe, where they burnt it, and by that means ſet the building on fire: For which ſeditious act Cicero paſſes that joke upon him, under the metaphor of light, which elſewhere he always uſes in a good ſenſe.

But to proceed: All forced and harſh metaphors ſhould be avoided; the one being no leſs diſagreeable to the mind than the other to the ear. Nor ſhould they come too thick in a diſcourſe. In a word, they ought not to be uſed, but either where a proper word is wanting, or they are more ſignificant or beautiful than the proper word.

55. Metonymy defined and explained.

II. *Metonymy.* This, as defined by Quintilian, is, *the putting one word for another*. But Voſſius deſcribes it more fully, when he calls it, "A trope, which changes the name of things that are naturally united, but in ſuch a manner as that the one is not of the eſſence of the other." That a metonymy is thus diſtinguiſhed from the other tropes, has been ſufficiently ſhown already in the two laſt chapters. When it is ſaid, *to put one word for another*, or, *to change the names of things*, the meaning is, that the word ſo uſed changes its ſenſe, and denotes ſomething different from its proper ſignification. Thus, when *Mars* is put for *war*, and *Ceres* for *corn*, they loſe their perſonal ſenſe, and ſtand for the effects of which thoſe deities were ſaid to be the cauſe. So likewiſe, when Virgil ſays,

He drank the frothing bowl,

the word *bowl* muſt neceſſarily ſignify the liquor in the bowl And when in another place, deſcribing the temple of Juno at Carthage, in which the actions of the Trojan war were repreſented, and the images of the heroes, he makes Æneas, upon diſcovering that of Priam among the reſt, cry out,

Lo here is Priam;

it is plain the word *Priam* there muſt ſtand not for his perſon, but his *image* or *figure*. And this property of changing the ſenſe of the word appears peculiar to metonymy. In treating upon a metaphor, we obſerved the miſtake of thoſe who teach, that a word uſed metaphorically loſes its proper ſignification; whereas it only changes its place, but not its ſenſe; being applied to a thing to which it does not naturally belong, by way of ſimilitude. And as the not attending to this has run ſome perſons into very great abſurdities, in treating upon metaphorical expreſſions, and reaſoning from them in the tropical ſenſe; ſo the like has happened to others in ſome inſtances of a metonymy, where, by miſapprehending their true nature, they have reaſoned from them in the literal ſenſe, as we ſhall ſhow preſently. A metonymy is not ſo extenſive as a metaphor, nor altogether ſo neceſſary: becauſe nothing is ſaid by a metonymy, which cannot be expreſſed in proper words; whereas metaphors are often uſed for want of proper words to expreſs ſome ideas. However, metonymies are very uſeful in language; for they enrich a diſcourſe with an agreeable variety, and give both force and beauty to an expreſſion. And what we obſerved with relation to a metaphor, is true alſo of this trope: that ſome metonymies, even in common diſcourſe, are more frequently made uſe of than the proper words in whoſe room they are put. So, *pale death*, *a blind way*, and *a happy ſtate*, are very common expreſſions with us. And it is more uſual to ſay, *This is ſuch a perſon's hand*, or *I know his hand*, than his writing, when we intend this latter ſenſe of the word.

We now proceed to the diviſion of metonymies; which are commonly diſtinguiſhed into four kinds, from the different manner in which things are naturally, but externally, united to one another. Now things are thus united, or one thing depends upon another, either with reſpect to its production, or in the manner of its exiſtence when produced. In the former way the effect depends upon its cauſe, and in the latter the adjunct upon its ſubjects. And hence ariſe four ſorts of metonymies, which receive their names from the *cauſe* and *effect*, the *ſubject* and the *adjunct*.

It is called a *metonymy* of the *cauſe*, when the external cauſe is put for the effect The external cauſe is twofold, the agent and end, which are uſually called the *efficient* and *final cauſe*. Of the former kind are ſuch metonymies, where the inventor or author is put for what was invented or effected by him. Thus, as we ſaid before, *Ceres* is ſometimes put for *corn*, the uſe of which ſhe was ſaid firſt to have introduced; and *Mars* for *war*, over which he was thought to preſide. And by this way of ſpeaking, any artiſt or writer is put for his work. So Juvenal, blaming the luxury and profuſeneſs of the Romans, ſays, *There are few tables without Mentor*; that is, which were not made by him, or after his manner. And our Saviour ſays, in the parable of the rich man and Lazarus, *They have Moſes and the prophets*, meaning the books of Moſes and the prophets. But under this ſort of metonymy is included not only the agent, ſtrictly ſo called, but alſo any means or inſtruments made uſe of in the doing of a thing, when put for the thing done. Thus, *polite literature* is called *humanity*, becauſe it cultivates and improves the human mind. And in that expreſſion of Cicero, *Words move nobody but him who underſtands the tongue*; the word *tongue*, which is the inſtrument of ſpeech, is put for *ſpeech* or *language*. And in the like ſenſe, *arms* are ſometimes put for *war*, and the *ſword* for *ſlaughter*. By the ſame kind of metonymy likewiſe any affection or quality is put for its effect. As when it is ſaid, *the end of government is to maintain juſtice*; that is, *ſuch mutual offices among men as are the effects of juſtice*. And ſo likewiſe in that of Cicero, *It is the buſineſs of magiſtrates to check the levity of the multitude*, by which he means tumults occaſioned by their levity. Moreover, as human affections are attributed to the Deity in a metaphorical ſenſe, ſo ſeveral parts of the human body are likewiſe aſcribed to him by this kind of metonymy. Thus, his *hand* and his *arm* are uſed to expreſs his power, as his *ear* and *eye*, his *care* and *providence*, theſe being the inſtruments of ſuch effects in mankind. Metonymies of the final cauſe are thoſe by which the end in doing a thing is put for the thing done. As when we ſay, *The watch is ſet*, meaning the *watchmen*, who are appointed for that purpoſe. And ſo likewiſe that expreſſion, *to make an example*, as it ſignifies, *to puniſh*, in order to deter others from the like crimes by ſuch an example. As alſo that of Virgil,

Phillis ſhould garlands crop:

by which are meant *flowers* to make garlands.

The ſecond kind of metonymy puts the effect for the efficient cauſe, whether the agent, or only the means and inſtrument. So Virgil calls the two Scipios *the deſtruction of Libya*, becauſe they were the agents who effected it. And Horace compliments his patron Mæcenas with the titles of being *his guard and honour*; that is, his guardian, and the author of his honour. But when Cicero tells the citizens of Rome, that *the death of Clodius was their ſafety*, he means the occaſion only of their ſafety. And elſewhere he calls that a *dark hope* and *blind expectation*, the effect of which was dubious and uncertain to thoſe who entertained it. And in like manner, the ſons of the prophets, when they were eating the pottage which Eliſha had ordered to be ſet before them, cried out, *There is death in the pot*; that is, ſome *deadly thing*, as is preſently after explained. And thus ſweat, which is the effect of labour, is ſometimes put for labour. As in the threat denounced againſt Adam, *In the ſweat of thy face ſhalt thou eat bread*, that is, by labour in cultivating the ground. And, in alluſion to this way of ſpeaking, Antony the orator tells Craſſus, "the improvement of the ſtyle by conſtant exerciſe, as he preſcribed, was a thing of much ſweat." And *virtue is ſaid to be gained by ſweat*, that is, continued care and exerciſe in ſubduing the paſſions, and bringing them to a proper regulation. But in theſe two expreſſions there is likewiſe a metaphor, the effect of bodily labour being applied to that of the mind. In all theſe inſtances, the effect is put for the efficient cauſe.

The third kind of metonymy is, when the ſubject is put for the adjunct. By ſubject here, in a large ſenſe of the word, may be underſtood that wherein ſome other thing is contained, or about which it is converſant; as likewiſe the poſſeſſor with reſpect to the thing he poſſeſſes; and the thing ſignified, when put for the ſign of it. Now, by the firſt of theſe ways of ſpeaking, the ſeat of any faculty or affection is uſed for the faculty or affection itſelf. So it is uſual to ſay, *a man of a clear head*, when we mean a clear mind or underſtanding; the ſeat of the mind being ſuppoſed to be in the head. And a perſon is ſaid *to have a warm heart*, becauſe the heart has been thought the ſeat of the affections. In like manner, the place where any actions are performed is put for the actions done in it. As when Cicero ſays, "Do not always think of the forum, the benches, the roſtra, and the ſenate;" meaning the diſcourſes which were uſually made in thoſe places. So likewiſe the country, or place of reſidence, is put for the inhabitants, as in that paſſage of Cicero. "And to omit Greece, which always claimed the pre-eminence for eloquence, and Athens, the inventreſs of all ſciences, where the art of ſpeaking was invented and perfected; in this city of ours, (meaning Rome), no ſtudies have prevailed more than that of eloquence:" where the words Greece and Athens ſtand to denote the inhabitants of thoſe places. And hither may alſo be referred thoſe expreſſions in which the time is put for the perſons living in it; as, *the degeneracy of the preſent age, the virtue of former times*. In the ſecond way above-mentioned, the object is uſed for the perſon or thing employed about it: As when Cicero ſays, "In time of battle the laws are ſilent; where by *laws* he intends the *judges*, who pronounce ſentence according to law. By the third of theſe ways, in which the poſſeſſor is put for the thing he poſſeſſes, we ſay, *to devour, deſtroy*, or *ruin a man*, meaning not his *perſon* but his *eſtate*. And mythologiſts explain the fable of Actæon by this trope, who is ſaid to have been devoured by his dogs; for by dogs they underſtand flatterers and paraſites, who conſumed his eſtate, and brought him to beggary. By the laſt way before recited, which puts the thing ſignified for the ſign, ſtatues and pictures are called by the names of the perſons which they repreſent: as in that jeſt of Cicero upon his brother Quintus, when, as Macrobius relates, "being in the province which his brother had governed, and ſeeing a large portrait of part of his body, holding a ſhield, though Quintus was but a little man, he ſaid, My half brother is bigger than my whole brother." The Popiſh doctrine of tranſubſtantiation is founded upon an abuſe of this trope. For when our Saviour, ſpeaking of the bread and wine at that time before him, ſays, "This is my body, and this is my blood," his plain meaning is, they were the ſigns of his body and blood, the thing ſignified being put for the ſign by this ſort of metonymy. But the Papiſts take the expreſſion literally, which muſt doubtleſs be very abſurd: ſince the words relate to the time then preſent, while Chriſt was yet living, and ſpoke them; when it was impoſſible for the bread and wine to be converted into his body and blood, it being evident to all who were preſent, that thoſe elements, and his body, exiſted ſeparately at the ſame time. But if the words are explained by this trope, the ſenſe is plain and eaſy, and the way of ſpeaking familiar to all writers. Whereas they who plead for the literal ſenſe might with equal reaſon aſſert that thoſe expreſſions above-mentioned are to be taken literally, in which ſeveral parts of the human body, as the hand, the arm, the ear, and the eye, are aſcribed to the Deity; or that, when our Saviour in a metaphorical ſenſe calls himſelf *a vine*, and *a door*, theſe words were deſigned to be applied to him ſtrictly and properly, and not by way of ſimilitude only, as is the caſe in all metaphors.

The fourth kind of metonymy is that wherein the adjunct is put for the ſubject, which is done in the ſame variety of ways as the former. It is therefore a metonymy of the adjunct, when the thing contained is put for that which contains it. As when Virgil ſays, "They lie down upon purple;" that is, upon couches dyed with purple. And again, "They crown the wine;" meaning the bowl which contained the wine, it being the cuſtom of the ancients to deck their bowls with garlands at their entertainments. By theſe tropes likewiſe virtues and vices are put for the perſons in whom they are found. As in that beautiful paſſage of Cicero, where, comparing the profligate army of Catiline with the forces of the ſtate, he ſays, "On this ſide modeſty is engaged, on that impudence; on this chaſtity, on that lewdneſs; on this integrity, on that deceit; on this piety, on that profaneneſs; on this conſtancy, on that fury; on this honour, on that baſeneſs; on this moderation, on that unbridled paſſion;

in a word, equity, temperance, fortitude, prudence, and all virtues, engage with injuſtice, luxury, cowardice, raſhneſs, and all vices." And to this trope thoſe expreſſions are to be referred, in which any thing is put for the object about which it is converſant. As in that ſaying of the wiſe man, "Hope deferred makes the heart ſick;" where hope is put for the thing hoped for. And thus Suetonius calls the emperor Titus *the love and delight of mankind*, whoſe mild and obliging temper rendered him the object of thoſe agreeable affections to all perſons under his government. A third uſe of this trope is by putting a thing for the time in which it was done. Thus we ſay of a perſon, *he has ſerved ſo many campaigns*, meaning ſo many ſummers, that being the uſual time in which armies are drawn out into the field. Laſtly, by this metonymy, the ſign is put for the thing it ſignifies; as, *the ſceptre* for *the regal dignity*, and *the ſword* for *the authority of the magiſtrate*.

56 Synecdoche explained. III. *Synecdoche.* This is a trope by which either the whole of a thing is put for a part of it, or a part for the whole; ſo that the two things, whoſe ideas are preſented to the mind in this trope, are internally related to each other; by which, as has been ſhown already, it is diſtinguiſhed from all the other tropes. In a *ſynecdoche* the word retains its proper ſenſe, and the expreſſion is elliptical, as will appear by the ſeveral ſpecies of it, wherein the ellipſis in moſt of the examples is very obvious, and may with no great difficulty be ſupplied. Now a thing may be conſidered as a whole in three different reſpects, which logicians call an *univerſal, eſſential, and integral whole*. An univerſal whole is any genus with regard to its ſeveral ſpecies: as, an *animal* with reſpect to *mankind* and *brutes*, or *philoſophy* with reſpect to the ſeveral *arts* and *ſciences* compriſed under it. An eſſential whole conſiſts of matter and form, as, a *man* of *body* and *ſoul*. And an integral whole is any body or quantity, with reſpect to the ſeveral parts of which the matter of it is compoſed, and into which it may be divided: as, an *human body* with reſpect to its *ſeveral members*; or a *year*, as diviſible into *months*, *weeks*, and *days*. And thus rhetoric is an integral whole in reſpect to the four parts that compoſe it; namely, invention, diſpoſition, elocution, and pronunciation. So likewiſe any aggregate body, as a civil community, which is diviſible into thoſe who govern and are governed; or any army, conſiſting of the general and his ſoldiers. As a whole therefore, in each of theſe acceptations of the word, is frequently put for a part, and a part for the whole; hence ariſe ſix ſpecies or ſorts of ſynecdoche.

The firſt of theſe puts the genus for the ſpecies.—Thus, virtue in general is ſometimes uſed to denote ſome particular ſort of virtue. As when Cicero mentions virtue as one of the four qualifications neceſſary in a general, he means greatneſs of mind. And ſo perſons are often commended for inſtances of virtue ſhown in their conduct, which reſpect only ſome ſingle virtue, as juſtice, temperance, or the like: And in this ſenſe Cicero calls Clodius *a deadly animal*. So when our Saviour commiſſions his apoſtles to *preach the goſpel to every creature*, the meaning is, *every rational creature*. And thus likewiſe, *to talk to a perſon* ſometimes denotes the ſame thing as *to blame* him, which is one way of talking.

The ſecond kind of ſynecdoche puts the ſpecies for the genus. Thus *bread* denotes any kind of food; as when a perſon is ſaid *to get his bread by his labour*. In the ſame way of ſpeaking, *money* is put for any kind of wealth in general. And it is an uſual expreſſion to ſay, that *wine deſtroys more than the ſword*; that is, than any *hoſtile arms*. And the legal form of baniſhment among the Romans was, to prohibit perſons *the uſe of fire and water*; that is, *the moſt common and ordinary neceſſaries of life*, in which all others were included.

The third ſpecies of this trope is, when the eſſential whole is put for one of its parts; that is, either for the matter or form. Thus, in the evangeliſt, Mary Magdalen ſays, *They have taken away my Lord, and I know not where they have laid him*, meaning his *body*.—So it is uſual to ſay of a deceaſed perſon, *He was buried at ſuch a time*. And in the inſcriptions of ſepulchral monuments we frequently meet with this expreſſion, *Here lies ſuch an one*; that is, his *corpſe*. Nor are inſtances uncommon in which the whole being is put for the form. Thus when Cicero ſays, *Thoſe perſons live who have fled from the confinement of the body, as from a priſon*; by *perſons* muſt neceſſarily be underſtood their *ſouls*, which are here diſtinguiſhed from and ſet in oppoſition to their *bodies*. And ſo Virgil repreſents Æneas as meeting with Dido and ſome of his Trojan friends in the infernal regions; by which are meant their *ghoſts*.

The fourth kind of ſynecdoche is, when either the matter or form is put for the whole being. Thus *ſilver* and *gold* are uſed to ſignify money made of thoſe metals; as when we ſay, *I have ſo much ſilver*, or *ſo much gold*. And the word *ſoul*, both in our own and other languages, is put for the *whole perſon*. So with us, *a merry ſoul*, and *a dull ſoul*; in Cicero, *dear ſouls*; and in Horace, *candid ſouls*, are all uſed in this tropical ſenſe. But this way of ſpeaking occurs nowhere more frequently than in the ſacred writings. Thus, for inſtance, it is ſaid, *All the ſouls which came with Jacob into Egypt*, meaning the *perſons*. And again, *The ſoul that ſinneth it ſhall die*; from which expreſſion, and others of the like import, ſome perſons, by not attending to the nature of this trope, have been erroneouſly led to infer that the ſoul is naturally mortal. But ſometimes only part of the matter ſtands to expreſs the whole eſſence or being. So we imitate the Latins in uſing the word *caput* or *head* to denote either a *perſon* or *thing*. For, as with them *lepidum caput*, ſo with us *a witty head*, ſignifies the ſame as *a man of wit*. And in the ſame ſenſe, *ſo many head of cattle* means *ſo many entire cattle*.

By the fifth ſort of ſynecdoche, the whole of any material thing or quantity, whether continued or diſcrete, is put for a part of it. So when Cicero ſays, *A war is kindled through the whole world*, in compliment to his country, he calls the Roman empire *the world*. And this expreſſion is alſo uſed by hiſtorians. Thus Cornelius Nepos, ſpeaking of the quarrel between Mark Antony and Auguſtus, tells us, *that each of them deſired to be lord of the world*. And in like manner St Luke ſays, *There went out a decree from Cæſar Auguſtus*,

Auguſtus, that all the world ſhould be taxed. So in St Paul's ſhipwreck, it is ſaid, *They ran the ſhip aground*, that is, *the head of her*, for it is plain by what follows, that the ſtern was looſe. And as to diſcrete quantity, our Saviour, uſing this trope, ſaid he ſhould be *three days and three nights in the heart of the earth.* Though he did not continue three whole days and nights in the grave, but only part of the firſt and third day, and the whole ſecond day, with the two whole nights between the firſt and third day, according to our way of reckoning. For he was buried on Friday in the afternoon, and reſted in the grave that night, with the following day, which was the Jewiſh Sabbath, and was riſen on the morning of the next day, So that we muſt neceſſarily have recourſe to this ſynecdoche, which puts the whole for the part, to clear up that event

By this kind of ſynecdoche, alſo, the plural number is ſometimes put for the ſingular. Thus St Matthew ſays, *The thieves who were crucified with our Saviour reviled him:* though it is plain from St Luke, that only one of them did ſo. It may alſo be referred to this trope, when a certain number is put for an uncertain one. So it is an uſual way of expreſſion to ſay, *I have ſeen or done ſuch a thing an hundred or a thouſand times;* when perhaps ſo many are not really intended, but only in general ſome conſiderable number.

The ſixth and laſt kind of ſynecdoche puts a part of any material thing or quantity for the whole of it. So we ſay of a man, *He ſhelters himſelf under ſuch an one's roof;* that is, *in his houſe*. And of a fleet, that it *conſiſts of ſo many ſail*; meaning, *ſo many ſhips*. And by this trope, that is aſcribed to a ſingle perſon which was done by the aſſiſtance of others, and in conjunction with them: As when it is ſaid, that *Hannibal killed forty thouſand Romans at the battle of Cannæ;* For an army is an aggregate body, of which the general is the head, and conſequently the chief part of it. And to this kind of ſynecdoche may alſo be referred ſuch expreſſions in which the ſingular number is put for the plural: as if one ſhould ſay, *A man is liable to be miſled by the influence of irregular paſſions;* meaning *all men*, or *mankind in general*. Or when leſs than the real number is put for any round number: Thus ſome ancient writers, when they ſpeak of the Grecian armada that came againſt Troy, call it a fleet of *a thouſand ſhips*; though, according to Homer's liſt, it contained 1186. And ſo likewiſe the Greek interpreters of the Old Teſtament are uſually called the *Seventy*; whereas, in reality, they were ſeventy-two.

57
Irony defined and illuſtrated.

IV. *Irony*. This is *a trope in which one contrary is ſignified by another:* As if *any* one ſhould ſay, *Well done*; when at the ſame time his deſign is to intimate that the thing was *ill done*. So that, by this manner of expreſſion, the ſpeaker appears to mean ſomething contrary to the ſenſe of the word he makes uſe of. Not that the word is changed from its uſual ſignification; but by the circumſtances attending the expreſſion, we perceive the contrary to what is ſpoken is intended. Quintilian obſerves, that an irony may be known one of theſe three ways: "By the manner of pronunciation, or from the nature of the perſon or the thing. For (as he adds) where any of theſe do not ſuit with the words, it is plain the ſpeaker intends the contrary." The irony is very plain from the manner of pronunciation in that paſſage of Terence, where Simo, ſpeaking to his ſervant by way of reproof, ſays, "You have taken great care indeed." From the circumſtances of the perſon, when Cicero, addreſſing to Catiline, ſays, "He went to your companion, that *excellent man*, Marcus Marcellus." When he calls him an *excellent man*, it is evident he means the contrary; becauſe no good man would be a companion of Catiline. And when he begins his oration for Ligarius with ſaying, "Cæſar, this is a *new* crime, and never heard of till now," the thing he is ſpeaking of ſhows it to be an irony; for it was not new, as all who were preſent very well underſtood.

The ſubjects of irony are vices and follies of all kinds. And this way of expoſing them is often more effectual than ſerious reaſoning: For many perſons, who, either from temper or want of reflection, cannot be moved by the force of an argument, are not proof againſt the poignancy of wit and raillery. And therefore we find the moſt grave and ſerious perſons have not declined the uſe of this trope upon proper occaſions. Socrates, whom the oracle pronounced the wiſeſt man of his age, gave ſo much into it, that he got the name of εἴρων, that is, the *droll*. In the ſacred writings we have a remarkable inſtance of it in the prophet Elijah, where he challenges the prieſts of Baal to prove the truth of their deity: For it is ſaid expreſsly, "He mocked them, and ſaid, Cry aloud, for he is a god; either he is talking, or he is purſuing, or he is on a journey, or peradventure he ſleepeth, and muſt be awaked." And Solomon takes the like method to expoſe the follies of youth by this ironical apoſtrophe, "Rejoice, O young man, in thy youth," with what follows, which is all ironical. Nay, our Saviour himſelf thought fit thus to reprove the Jewiſh doctors, when he ſays, "Full well ye reject the commandment of God, that ye may keep your own tradition." Where, by the words *full well*, or, as it is in the original, καλως, it is very evident that a ſevere reprimand was intended.

An irony is uſed on a variety of occaſions, as we ſhall ſhow from ſome inſtances in Cicero. Sometimes he applies it in a way of jeſt and banter: As when he ſays, "We have much reaſon to believe the modeſt man would not aſk him for his debt, when he purſues his life." At other times by way of inſult and deriſion: Thus when he would repreſent the forces of Catiline as mean and contemptible, "O terrible war, (ſays he), in which this band of rakes are to march under Catiline! Draw out all your garriſons againſt this formidable body." Again, at other times, to give the greater force to his argument, he would ſeem, as it were, by this trope to recal and correct what he had ſaid before; as in his oration for Milo: "But it is fooliſh in us to compare Druſus, Africanus, Pompey, and ourſelves, with Clodius; all our calamities were tolerable, but no one can patiently hear the death of Clodius." Now the character of Clodius was ſo well known, that all who were preſent muſt be ſenſible he meant the contrary. And, to name no more, an irony is never uſed to greater advantage, than when it is followed immediately by ſomething very ſtinging.

Thus, ſpeaking of Piſo, he ſays, "You have heard this philoſopher: he denies that he was ever deſirous of a triumph." And then addreſſing himſelf to him, he immediately adds, "O wretch! when you deſtroyed the ſenate, ſold its authority, ſubjected your conſulate to the tribune, overturned the ſtate, betrayed my life and ſafety for the reward of a province; if you did not deſire a triumph, what can you pretend you did not deſire?" This muſt effectually confound the falſe gravity at that time aſſumed by Piſo.

Art. II. Secondary Tropes.

58
Secondary tropes ſimilar in nature, tho' not in name, to the former ones.

Secondary tropes are ſo called, becauſe they are all of the ſame nature with the former, and may be referred to ſome or other of them, though they have received different names.

They are chiefly eight in number; *Antonomaſia*, *Communication*, *Litotes*, *Euphemiſm*, *Catachreſis*, *Hyperbole*, *Metalepſis*, and *Allegory*. The three firſt of theſe are ſimple tropes, and may all be referred to a *Synecdoche*. But the five laſt are of a mixed or complex nature, and not confined to any one of the primary tropes; as will appear in treating upon them in order.

59
A common word often uſed by way of eminence for any thing remarkable.

I. A common or general word is ſometimes uſed for the proper name of ſome particular thing or perſon which upon any account is eminent and remarkable. So we ſay, *He is gone to the city*, or *he came from the city*, that is, *London*. And by the *Scriptures*, we mean the *Bible*. So likewiſe, in ſpeaking of perſons, *the orator* is uſed for Cicero, *the poet* for Homer or Virgil, and *the philoſopher* for Ariſtotle: and it is not unuſual to ſay *the apoſtle*, when we mean St Paul. On the contrary, the proper names of things or perſons are ſometimes applied to any other of the ſame character. Thus we uſe the word *goſpel* for any certain and undoubted truth And *Carthaginian faith* proverbially ſtood for the greateſt falſehood and deceit among the Romans. With the Greeks, *Hercules* ſignified a *ſtrong man*, *Neſtor* a *wiſe man*, and *Irus a beggar*; and the names of *Samſon*, *Solomon*, and *Job*, now anſwer the like characters. Both theſe ways of expreſſion are often very emphatical, and heighten the idea more than where things are expreſſed by their own name. To call a good orator *Cicero*, or an excellent poet a *ſecond Virgil*, includes not only an encomium upon the arts themſelves, but leads the mind to what is moſt perfect in them, and was peculiar to thoſe perſons. Theſe forms of ſpeech are called *antonomaſia*, and come properly under a ſynecdoche; for in the former the whole is put for a part, and in the latter a part for the whole.

60
A change of perſons common in oratory.

II. Nothing is more common with orators than a change of perſons. Sometimes, to avoid envy, and prevent the imputation of pride, in aſſuming to themſelves the praiſe of any laudable action, they aſcribe it to their hearers, and do not ſay, *we*, but *ye did ſo and ſo*. At other times, when it is neceſſary to remind them of ſomething which they have done amiſs, or to caution them againſt ſome wrong ſtep for the future; to prevent giving offence, they take it upon themſelves, or at leaſt join themſelves with them, and do not ſay, *you have done this*, or *do not you do this*; but, *we have done it*, or *let us not do it*. And again, at other times, in compliment to their hearers, they join them as partners in the commendable actions or virtues of other perſons; as when the whole body of the people is brought in to ſhare the praiſe ariſing from the ſucceſs of wiſe counſels or victorious arms. Such ways of ſpeaking often occur both in Demoſthenes and Cicero. They are called *communication*, and come properly under a ſynecdoche of the whole.

61
Litotes, where, by denying the contrary, more is meant than is expreſſed.

III. On the contrary, there is a mode of ſpeech, in which, by denying the contrary, more is intended than the words expreſs This way of ſpeaking is called *litotes*; and is often uſed for ſake of modeſty where a perſon is led to ſay any thing in his own praiſe, or to ſoften an expreſſion which in direct terms might found harſh or give offence. As if one ſhould ſay, *I do not commend you for that*; meaning, *I greatly diſcommend* or *blame you for it*: where more being underſtood than the words expreſsly denote, it is properly a ſynecdoche of the part. Not that this manner of ſpeaking is always to be ſo interpreted; but where it is not, there is no trope; which muſt be judged of by the circumſtances of the diſcourſe. But that it frequently is ſo uſed, might be eaſily ſhown from many inſtances; though it will be ſufficient to mention two or three. Cicero ſpeaking of Cotta, calls him *no mean orator*, whom he had juſt called *a very great orator*. And he ſays of Varro, that "he purſued his ſtudies not without induſtry; and afterwards gives him the character "of a man of the greateſt application." Which paſſages, compared together, plainly ſhow the import of thoſe negative expreſſions. And a friend of Cicero, writing to him, begins his letter thus: "Although I am ſenſible the news I ſend you will not be very pleaſant." This news was concerning the death of another friend of Cicero's; and there by the words *not very pleaſant*, muſt, to be ſure, be meant *very unpleaſant and melancholy*; but he choſe that expreſſion in the beginning of his letter, as the ſofteſt and leaſt ſhocking, the better to prepare him for the following account of what that news was. And in this way interpreters explain that paſſage in St Matthew: *And thou Bethlehem in the land of Judah are not the leaſt among the princes of Judah*, where, by *not the leaſt*, they underſtand the *greateſt*, or *very great*, upon account of the honour it received by the birth of our Saviour, as the words immediately following plainly intimate.

62
Ungrateful things ſoftened by agreeable words.

IV. When any diſpleaſing or ungrateful thing is expreſſed by a more ſoft and agreeable word, it is called *euphemiſm* And as the word made uſe of is either contrary to the proper word, or only different from it, it may be referred to different tropes. The Latins have a ſoft way of expreſſing their diſregard to a perſon, by ſaying *valeat*; which we have borrowed from them, and ſay, *fare him well*. When the contrary being intended to what is expreſſed, it comes properly under an *irony*. And as the word *death* carries in it an idea that is diſagreeable to human nature, inſtead of ſaying a perſon is dead, we often ſay *he is deceaſed*, or *departed*, which we have alſo taken from the Latins who uſe the words *deceſſit* and *obiit* in the ſame ſenſe. So that in both languages it comes under a ſynedoche of the whole; to depart out of life being one ſort of departure. But when the evangeliſt, ſpeaking of Stephen, who was ſtoned to death, expreſſes it by ſaying, that *he fell aſleep*; this is a beautiful metaphor, taken from the ſimilitude between the death of a good man and ſleep.

63 Catachreſis, or harſh tropes.

V. *Catachreſis* ſignifies in general any harſh trope, though it is moſt commonly found in metaphors. It is principally uſed by poets, who make choice of it for novelty, or to enforce an expreſſion, where the proper word does not ſeem ſtrong enough. As when Milton, in deſcribing the angel Raphael's deſcent from heaven, ſays, he

Sails between worlds and worlds;

where the novelty of the word enlivens the image more than if he had ſaid *flies*. But it is ſometimes found in the graveſt authors, and even in the ſacred writings. So we read of the *blood of the grape*. And Solomon ſays, *the horſe-leech hath two daughters*. In all theſe inſtances the trope is a metaphor. But when St John ſays in the Revelations, *I turned to ſee the voice that ſpake to me*, it is here a metonymy of the adjunct; the word *voice* being put for the perſon who uttered it. In St Matthew we read of *Simon the leper*; not that he was then a leper, but had been ſo, and was cured; which is a *ſynecdoche* of the part. And when a criminal is ſaid *to have had his reward*, that is, his puniſhment, it is an *irony*.

64 Hyperbole the boldeſt of all tropes.

VI. *Hyperbole* is the boldeſt of all tropes; for it exceeds the ſtrict bounds of truth, and repreſents things either greater or leſs, better or worſe, than they really are. But the repreſentation is made in ſuch a manner as not to impoſe on the hearers. For an *hyperbole* is not uſed to define or deſcribe any thing accurately, but only to magnify or depreſs it in a conſiderable degree, when we either cannot or do not chooſe to repreſent it exactly. The exceſs in this trope is called *auxeſis*; as when we ſay of any thing that is very high, *it reaches to the ſkies*. The defect, or contrary extreme, is termed *meioſis*: So we ſay of a very [illegible] perſon, *he is nothing but ſkin and bones*, or *a mere* [illegible]*ton*. It is principally metaphorical, but ſo[illegible]ken from other tropes. When Saul and Jonath[illegible] ſaid to have been *ſwifter than eagles, and ſtronger th*[illegible]*ions*, the expreſſion is founded in ſimilitude, and is therefore a metaphor. When, inſtead of ſaying Cato was a very virtuous man, the hiſtorian calls him *the image of virtue*; it is an hyberbolical metonymy of the adjunct for the ſubject. And when we read in the Moſaic hiſtory *of cities fenced up to heaven*, there is a *ſynecdoche*. But if a man of weak ſight be ſaid *to be eagle-eyed*, it is an *irony*. Thoſe hyperboles which are expreſſed comparatively, are commonly moſt emphatical, becauſe they ſhow a peculiarity in the exceſs. To ſay a thing is *as light as a feather*, carries the idea very far; but to ſay *it is lighter*, not only carries it ſtill farther, but alſo heightens it, by leaving the mind at an uncertainty where to fix the limits.

65 Metalepſis, where two or more tropes are meant under one word.

VII. Sometimes two or more tropes, and thoſe of a different kind, are contained under one word; ſo that ſeveral gradations, or intervening ſenſes, come between the word that is expreſſed, and the thing deſigned by it. And this is called a *metalepſis*. The conteſts between Sylla and Marius proved very fatal to the Roman ſtate. Julius Cæſar was then a young man. But Sylla obſerving his aſpiring genius, ſaid of him, "In one Cæſar there are many Mariuſes." Now in this expreſſion there is a metalepſis. For the word *Marius*, by a *ſynecdoche*, or *antonomaſia*, is put for any ambitious and turbulent perſon; and this again, by a *metonymy* of the cauſe, for the ill effects of ſuch a temper to the public. So that Sylla's meaning, diveſted of theſe tropes, was, that Cæſar would prove the moſt dangerous perſon to the Roman ſtate that ever was bred in it: which afterwards proved true in the event. So when Virgil, deſcribing that part of the African coaſt where Æneas arrived with his ſhips, ſays, *A dark wood hung over it*; the word *dark*, by a metonymy of the effect, is put for *ſhady*, and that again by the ſame trope for *thick*; for his meaning is, a *thick wood*. But the words of Dido, in the ſame poet, contain a larger gradation, when ſhe ſays,

Happy, ah truly happy, had I been,
If Trojan ſhips our coaſts had never ſeen.

In which expreſſion, firſt by a metonymy of the adjunct, the ſhips are put for the Trojans in the ſhips: and theſe, by a ſynecdoche of the whole, for Æneas, who was one of them; and again his arriving on the coaſt, by a metonymy of the cauſe, for her ſeeing him; and laſtly, her ſeeing him, by the ſame trope, for the paſſion ſhe had for him. So that her meaning is, ſhe had been happy, if ſhe had never entertained a paſſion for Æneas. This trope is more frequently to be met with in poets than in orators, as they take greater liberty in uſing diſtant alluſions than is ſuited to that perſpicuity of expreſſion which is required in oratory. But as Quintilian has well obſerved, all the intermediate links of the chain in this trope are of no further uſe than to lead the mind gradually from the firſt to the laſt, the better to perceive their connection. As in the example laſt mentioned, relating to Dido, if we drop all the intervening ſteps, and connect the words expreſſed with what is directly intended, they will be found to contain a very remote cauſe put for the effect, which comes under a metonymy. On the contrary, in the ſecond example, where *dark* ſtands for *thick*, the effect is put for a remote cauſe. And the firſt, which is founded in a ſimilitude of temper between Cæſar and Marius, belongs to a *metaphor*.

66 Allegory, a continuation of tropes thro' ſeveral ſentences.

VIII. *Allegory*. As a metalepſis compriſes ſeveral tropes in one word, ſo this is a continuation of ſeveral tropes in one or more ſentences. Thus Cicero ſays, "Fortune provided you no field, in which your virtue could run and diſplay itſelf:" where the words *field* and *run* are metaphors taken from corporeal things, and applied to the mind. And in another paſſage, ſpeaking of himſelf, he ſays, "Nor was I ſo timorous, that after I had ſteered the ſhip of the ſtate through the greateſt ſtorms and waves, and brought her ſafe into port, I ſhould fear the cloud of your forehead, or your colleague's peſtilent breath. I ſaw other winds, I perceived other ſtorms, I did not withdraw from other impending tempeſts; but expoſed myſelf ſingly to them for the common ſafety." Here the ſtate is compared to a ſhip, and all the things ſaid of it under that image are expreſſed in metaphors made uſe of to ſignify the dangers with which it had been threatened. And indeed allegories generally conſiſt of metaphors; which being the moſt beautiful trope, a number of them well choſen and put together is one of the fineſt and brighteſt ornaments in language, and exceeds a ſingle metaphor in luſtre, as a conſtellation does a ſeparate ſtar. It is true, that allegories are ſometimes found in other tropes; but this is very rare. In that known expreſſion of Terence, the tropes are all metonymies: *Without Ceres and Bacchus, Venus grows cold;* that is, diveſted of the tropes, *Without meat and drink, love dies.* And Samſon's riddle is made up of ſynecdoches: "Out of the eater came forth meat, and out of the ſtrong came forth ſweetneſs." But there is no ſmall ſkill required in the right management of allegories. For care ſhould be taken that the ſame kind of trope be carried through the whole, ſo as to compoſe one uniform and conſiſtent ſet of ideas: otherwiſe they dreſs up a chimera, a thing that has no exiſtence, and of which the mind can form no perception. And, as Quintilian ſays very juſtly, "to begin with a tempeſt and end with a fire, would be very ridiculous and unnatural." It is likewiſe very neceſſary that the alluſions be all plain and evident, eſpecially where the name of the thing alluded to is not expreſſed. Theſe are called *pure allegories.* As that of Cicero: "So it happens, that I, whoſe buſineſs it is to repel the darts, and heal the wounds, am obliged to appear before the adverſaries have thrown any dart; and they are allowed a time to attack us, when it will not be in our power to avoid the aſſault; and if they throw a poiſonous dart, which they ſeem prepared to do, we ſhall have no opportunity to apply a remedy." The tropes here are all taken from military affairs, without any intimation what they are applied to. But that is plain from the context of the diſcourſe. For he is ſpeaking of the diſadvantages he laboured under in defending his client againſt thoſe of the oppoſite ſide, and ſo applies to the bar thoſe terms which were proper to the field. But where the reference is not evident, it becomes a riddle: which is nothing elſe but an obſcure allegory. To avoid this, therefore, the beſt writers generally uſe what they call *mixed allegories;* that is, ſuch wherein the proper name of the thing is expreſſed, which the whole ſimilitude reſpects. Of this kind is that in the ſpeech of king Philip of Macedon, given us by Juſtin, where he ſays, "I perceive that cloud of a dreadful and bloody war ariſing in Italy, and a thunder-ſtorm from the weſt, which will fill all places with a large ſhower of blood, wherever the tempeſt of victory ſhall carry it." The proper words *war, blood,* and *victory,* being joined to the tropes *cloud, ſhower,* and *tempeſt,* in this ſentence, render the ſeveral parts of the ſimilitude plain and evident. Quintilian thinks thoſe allegories moſt beautiful, where the whole ſimilitude is expreſſed, and thoſe words, which in their proper ſenſe relate to one of the two things between which the compariſon is made, are allegorically applied to the other: As when Cornelius Nepos ſays of Atticus, "If that pilot gains the greateſt reputation who preſerves his ſhip in a boiſterous and rocky ſea; ought not he to be thought a man of ſingular prudence, who arrived in ſafety through ſo many and ſo great civil tempeſts?" Theſe are the allegories with which orators are chiefly concerned.

§ 2. *Of Figures.*

This term ſeems to have been borrowed from the ſtage, where the different habits and geſtures of the actors, ſuitable to the ſeveral characters they ſuſtained, were by the Greeks called σχηματα, and by the Latins *figuræ:* And it is not unuſual with us to ſay of a perſon, both with reſpect to his dreſs and action, that he makes *a very bad,* or *a very graceful, figure.* And as language is the dreſs, as it were of our thoughts, in which they appear and are repreſented to others; ſo any particular manner of ſpeaking, may, in a large ſenſe of the word, be called its *figure,* in which latitude writers ſometimes uſe it. But rhetoricians have reſtrained the ſenſe of the word to ſuch forms of ſpeech as differ from the more common and ordinary ways of expreſſion; as the theatrical habits of actors, and their deportment on the ſtage, are different from their uſual garb and behaviour at other times. A *figure* therefore, in the ſenſe it is uſed by rhetoricians, is, *A mode of ſpeaking different from, and more beautiful and emphatical than, the ordinary and uſual way of expreſſing the ſame ſenſe;* or, in other words, *That language which is ſuggeſted either by the imagination or the paſſions.* Now as the habits and geſtures of our bodies are in a manner infinitely variable, ſo it is plain that the different forms of ſpeech are almoſt innumerable. But every alteration from the common manner ought not to be eſteemed a figure, nor deſerves that character. It muſt contain ſome beauty, or expreſs ſome paſſion, to merit a place among rhetorical figures, and be marked out for imitation.

67 The term *figure* apparently borrowed from the ſtage.

The ſubject of *figure* ſeems to have been one of the laſt things which was brought into the art of oratory, in order to complete it. Ariſtotle, who treats ſo accurately upon other parts, ſays very little of this. But the Greek writers who came after him have abundantly ſupplied that deficiency. It is to them we owe the chief obſervations that have been made on this ſubject. They took notice of the ſeveral modes and turns of expreſſion, obſerved their force and beauty, and gave them particular names by which they might be known and diſtinguiſhed from each other. And indeed they have treated the matter with ſuch minuteneſs and ſubtilty, that Quintilian ſeems, not without reaſon, to think they have multiplied figures to an exceſs. But though it was ſo late before they were taken notice of, and introduced into the art of ſpeaking, yet the uſe of them in diſcourſe was doubtleſs very ancient. The author of Homer's life, which ſome have aſcribed to Plutarch, has ſhown, by examples taken out of him, that there is ſcarce a figure mentioned by rhetoricians, but is to be met with in that moſt ancient poet. And, if we conſider the nature of ſpeech, we ſhall eaſily perceive that mankind muſt have been under a neceſſity very early to introduce the uſe of *tropes* for ſupplying the want of proper words to expreſs their ſimple ideas: ſo the like neceſſity muſt have put them upon the uſe of figures to repreſent their different paſſions; though both of them were afterwards increaſed, and improved in ſuch a manner as to become the chief ornaments of language. The paſſions of men have been always the ſame; they are implanted in us by nature, and we are all taught to diſcover them by the ſame ways. When the mind is diſturbed, we ſhow it by our countenance, by our actions, and by our words. Fear, joy, anger, alter the countenance, and occaſion different emotions and geſtures of the whole body. And we know with what paſſion a man is affected, by hearing his words, though we do not ſee him. He does not expreſs himſelf as he uſually does at other times when cool and ſedate. Objects appear to him in a different view, and therefore he cannot but ſpeak of them in a different way. He interrogates, he exclaims, he admires, he appeals, he invokes, he threatens, he recals his words, repeats them, and by many other different turns of expreſſion varies his ſpeech no leſs than his countenance, from his common and ordinary manner. Now as nature ſeems to teach us by theſe figurative expreſſions how to repreſent the different commotions of our minds, hence ſome have thought fit to call figures *the language of the paſſions*. And as theſe are given us, among other wiſe ends, to excite us the better to provide for our preſervation and ſafety, this is done ſometimes by force of arms, and at other times by diſcourſe. And therefore Cicero very handſomely compares the conduct of an orator to the exerciſes of the palæſtra: in which, as each combatant endeavours not only to defend himſelf, and attack his adverſary, but likewiſe to do both with decency; ſo the principal weapons of an orator, as he repreſents them, are figures, which being no leſs the ornaments of language than images of our paſſions, anſwer all theſe purpoſes. Beſides, figures chiefly diſtinguiſh the different kinds of ſtyle, furniſh it with an agreeable variety, and often ſerve to repreſent things in a clear and forcible manner.

From this ſhort account of the nature of figures, the advantage of them to an orator is very evident. They are a ſort of natural eloquence, which every one falls into without attending to it, ſuitably to that temper of mind with which he is affected himſelf, and is deſirous to affect others. In a cool and ſedate diſcourſe, ſuch figures as convey our ſentiments with the greateſt ſtrength and evidence are moſt proper. And there are others, which are ſuited to brighten and enliven more gay and ſprightly ſubjects. Others again are more peculiarly adapted to expreſs the diſorders and perturbations of the mind. To repeat the ſame thing again would many times be deemed a tautology and impertinent; but to do this when the mind is ruffled, is not only allowable, but the repetition renders it more ſtrong and affecting. So likewiſe to interrogate, exclaim, or admire, under the influence of a paſſion, impreſſes the hearers, and diſpoſes them to attention; whereas at another time perhaps ſuch ways of ſpeaking would ſcarce be conſiſtent with prudence. There is a natural ſympathy in mens minds, which diſpoſes them to receive impreſſions from thoſe with whom they converſe. Thus one gay and pleaſant companion gives a cheerfulneſs and vivacity to a whole company; whereas, on the contrary, one who is dull and phlegmatic damps the ſpirits of all about him, and affects them with the ſame gloomy temper. Figures are peculiarly ſerviceable to an orator for anſwering theſe different intentions. And as he finds them in life, from thence he muſt copy them; as a painter does the features of the countenance, and the ſeveral parts of the body; figures being to the one what lines and colours are to the other. The deſign of Catiline to deſtroy the Roman ſtate and burn the city, is a ſtory well known. There was an army drawn together at a proper diſtance to favour the undertaking; and others were left in Rome, who had their parts aſſigned them for burning the city, and deſtroying thoſe who ſhould eſcape the flames. And, in a word, every thing was ready for putting in execution this horrid and barbarous ſcheme. So that nothing retarded it but the taking off Cicero, who was then conſul, which was thought neceſſary to be done firſt. Cicero, upon information of the deſign againſt his life, finds means to prevent it, and the ſame day calls together the ſenate. And Catiline, who was a man of conſummate boldneſs, had the confidence to appear in that aſſembly. Upon their meeting, Cicero opens to them the whole affair of the conſpiracy, and the deſign againſt himſelf, in a moſt warm and pathetic harangue. In which he had two things in view; to raiſe the indignation of the ſenate againſt the conſpirators, and particularly againſt Catiline; and, either by terrifying or exaſperating him, to oblige him to leave the city. Now he does not begin this ſpeech in his uſual manner at other times, by addreſſing to his audience, beſpeaking their favour and attention, or letting them gradually into the deſign of what he was about to ſay; but as Catiline was preſent, he immediately falls upon him with vehemence, in the following manner: "How far, Catiline, will you abuſe our patience? How long will your fury inſult us? What bounds will you ſet to your unbridled rage? Does neither the night-guard of the palace, nor the city-watch, nor the peoples fear, nor the agreement of all good men, nor the meeting of the ſenate in this fortified place, nor the countenances and looks of this aſſembly, at all move you? Do not you perceive your deſigns are diſcovered, and that all who are preſent know of your conſpiracy? Who of us, do you think, is ignorant of what you did the laſt night, and the night before, where you was, who was with you, and what you reſolved on? O times! O manners! The ſenate knows this, the conſul ſees it; and yet this man lives!—lives? nay, comes into the ſenate, joins in the public counſels, obſerves and marks out each of us for deſtruction!" And in the ſame impetuous ſtrain he proceeds through his whole ſpeech, interſperſing a great variety of the like ſtrong and moving figures. And the diſcourſe had its deſired effect: for when Catiline ſtood up afterwards to make his defence, the whole ſenate was ſo inflamed, and their reſentments againſt him roſe ſo high, from what Cicero had ſaid, that they had not patience to hear him ſpeak; upon which he left both them and the city. Had Cicero, inſtead of venting his juſt indignation againſt the author of ſo barbarous and inhuman a deſign, in the manner he did, by figures ſuited to ſtrike the paſſions of his hearers; had he, inſtead of this, attempted to reaſon with him, and told the ſtory in a cold and lifeleſs manner, he would have expoſed himſelf to the contempt of Catiline; and by leaving the ſenate little or nothing moved at what he ſaid, prevented perhaps their coming to thoſe ſpeedy and vigorous reſolutions which were neceſſary at ſo critical a juncture. Let us ſuppoſe him to have expoſtulated with Catiline in much the ſame words as before, but thrown into a different form, and diveſted of thoſe pathetic figures. As thus: "Catiline, you have really abuſed our patience to a great degree. You have inſulted us with your furious proceedings a long while. You ſeem to have fixed no bounds to your unbridled rage. Neither the night-guard of the palace, nor the city-watch, nor the peoples fear, nor the agreement among good men, nor the calling together of the ſenate in this fortified place, nor the countenances and looks of this aſſembly, appear to move you in the leaſt. I aſſure you we are all of us appriſed of what you did the laſt night, and the night before, where you was, and who were with you, and what reſolutions you came to. Theſe are ſad times, the age is very degenerate; that the ſenate ſhould know all this, the conſul ſee it; and yet that this man ſhould live, come into the ſenate, hear all our debates, and mark us out to deſtroy us." You ſee the ſenſe is entirely the ſame, and the words too in a great meaſure; ſo that there is little more than an alteration in the form of them. And yet who does not perceive how flat and languid ſuch a way of talking muſt have appeared at that time? and how much it loſes of that ſpirit and energy, which ſhows itſelf in Cicero's manner of expreſſion? Had he delivered himſelf thus, it might indeed have made the ſenate look upon Catiline as an abandoned wretch, loſt to all virtue and goodneſs, and perhaps have moved ſome to pity him on that account; as we are eaſily induced to compaſſionate perſons in ſuch circumſtances, eſpecially when deſcended from noble and virtuous anceſtors, which was his caſe. But ſure it would have been ill ſuited to fire their minds with that generous regard for their country, and the neceſſary precautions for its ſecurity, which the circumſtances of the ſtate then required. Nor would Catiline have been at all deterred by it, but rather encouraged in the proſecution of his deſigns, from the little effect a ſpeech ſo managed muſt probably have had upon the minds of the ſenators. But Cicero knew very well that the paſſions of mankind are the ſprings of action; that it is many times not ſufficient for an orator to convince their minds, by ſetting the truth in a clear light; but he muſt alſo raiſe their hopes, alarm their fears, inflame their anger, or excite ſome other ſuitable paſſion, before they will be brought to act with that zeal and fervour which the caſe may require. And as he was admirably well ſkilled in this art of touching the paſſions, he ſeldom fails to fix upon the proper methods of doing it, and makes choice of ſuch figures and modes of ſpeaking as in the ſtrongeſt manner repreſent the emotions of his own mind. For every paſſion is not to be expreſſed by the ſame figures, any more than it is drawn by the ſame lines, or painted with the ſame colours. When Dido finds that Æneas is about to leave her, ſhe uſes all her arts to detain him. And as perſons in great diſtreſs are ſeldom at a loſs to expreſs their condition in the moſt affecting way; ſhe diſcovers her fear, anger, revenge, with the whole crowd of diſorders which then poſſeſſed her mind, in a variety of moving figures, ſuited to raiſe the counter paſſions in his breaſt, as is finely repreſented by Virgil in that artful ſpeech he has made for her, which we forbear to recite for no other reaſon but the length of it. But what particular figures are moſt accommodated to anſwer the ſeveral ends propoſed by them, will beſt appear when we come to treat of them ſeparately.

We ſhall therefore now proceed to lay down a few directions for the proper uſe of figures. And firſt they ſhould always be accommodated to the ſentiments, and riſe in proportion to the images deſigned to be conveyed by them. So far as they are founded in reaſon, they are ſuited to impreſs the mind; but where the language outſtrips the thought, though it may pleaſe the ear, and ſome weak perſons may be carried away with a pomp of words, yet an intelligent hearer will ſoon ſee through the thin and airy dreſs. It is the ſenſe which gives weight to the figure, as that by ſtriking the imagination awakens the mind, and excites it to act in conformity to reaſon. Again, in the uſe of pathetic figures, it is generally better to be nervous than copious, that the images, by their cloſer union, may impreſs the mind with greater force and energy; though in ſuch figures as are deſigned for ornament or illuſtration, a more diffuſive way of painting is ſometimes agreeable. But farther, the too frequent uſe of figures ought to be avoided. For what was obſerved in relation to tropes, is alſo true with reſpect to theſe; that a great number of them is apt to darken and obſcure the ſtyle. And beſides, Cicero's reflection in this caſe is very juſt, That "it is hard to ſay, what ſhould be the reaſon, that thoſe things, which moſt affect us with a ſenſible pleaſure, and at firſt ſight ſooneſt move us, do likewiſe ſooneſt cloy and ſatiate us." But that it is ſo, we find by common experience. Laſtly, figures ſhould be ſo interwoven in a diſcourſe, as not to render the ſtyle rough and uneven, ſometimes high and at other times low; now dry and jejune, then pompous and florid. In a word, they ſhould rather ſeem to ariſe from nature than art; to offer themſelves, than to be the effect of ſtudy; and to appear not like patches upon a face, but the agreeable beauty of a ſound and healthful complexion. But of this we ſhall have occaſion to ſpeak more at large hereafter, in treating upon the different kinds or characters of ſtyle.

As to the diviſion of figures, which is what remains to be conſidered, they are uſually divided into two ſorts, figures of words, and figures of ſentences. The difference between them conſiſts in this; that in the former, if you alter the words, or ſometimes only the ſituation of them, you deſtroy the figure; but in the latter the figure remains, whatever words are made uſe of, or in what manner ſoever the order of them is changed. Thus when the name of a perſon or thing is repeated, to intimate ſome known property or quality belonging thereto, it is a verbal figure called *place*. Cicero was a true patriot and hearty lover of his country. And therefore we ſhall uſe this figure in ſaying, that *at the time of Catiline's conſpiracy Cicero appeared like Cicero*. The ſenſe would remain the ſame, but the figure would be loſt, if we ſhould alter the words, and ſay, *at that time Cicero appeared like himſelf*. So when two or more ſentences, or members of a ſentence, end with the ſame word, it is called *epiſtrophe*; as when we ſay, *To loſe all reliſh of life, is in effect to loſe life*. But if only the order of the words be changed in the latter clauſe thus, *To loſe all reliſh of life, is to loſe life in effect*; the figure vaniſhes. And this is the nature of the verbal figures. But it is not ſo in figures of ſentences: they continue the ſame, whatever alterations are made in the brick, ſome that it was a piece of bark; and others aſſert, that it was a ſhell. The word admits moſt of theſe interpretations. But what determines its true ſenſe, is the epithet given it by ancient authors, of *ceramitè maſtix*; which words ſignify, "The puniſhment of potter's clay;" and this expreſſion ſeems to us a proof, that the word ὄστρακον when applied on this occaſion, ſignifies a "piece of baked earth, in the form of a ſhell;" and undoubtedly the Latin authors had this idea of the word here, for they tranſlated it by *teſtula*.

The ancients are likewiſe divided with regard to the time when oſtraciſm was inſtituted. But they all agree, that the perſon who moved the law was its firſt victim. But as to the name of its patron, and the time of its eſtabliſhment, they differ extremely. Many are of opinion, that oſtraciſm owes its origin to very remote times.

However that be, the puniſhment of oſtraciſm was inflicted by the Athenians when their liberty was in danger. If, for inſtance, jealouſy or ambition had ſowed diſcord among the chiefs of the republic; and if different parties were formed, which threatened ſome revolution in the ſtate; the people aſſembled to propoſe meaſures proper to be taken in order to prevent the conſequences of a diviſion which in the end might be fatal to freedom. Oſtraciſm was the remedy to which they uſually had recourſe on theſe occaſions; and the conſultations of the people generally terminated with a decree, in which a day was fixed for a particular aſſembly, when they were to proceed to the ſentence of oſtraciſm. Then they who were threatened with baniſhment, omitted no aſſiduity or art which might gain them the favour of the people. They made harangues to evince their innocence, and the great injuſtice that would be done them if they were baniſhed. They ſolicited, in perſon, the intereſt of every citizen; all their party exerted themſelves in their behalf: they procured informers to vilify the chiefs of the oppoſite faction. Some time before the meeting of the aſſembly, a wooden incloſure was raiſed in the forum, with ten doors, *i. e.* with as many as there were tribes in the republic; and when the appointed day was come, the citizens of each tribe entered at their reſpective door, and threw into the middle of the incloſure the ſmall brick on which the citizen's name was written whoſe baniſhment they voted. The archons and the ſenate preſided at this aſſembly, and counted the billets. He who was condemned by 6000 of his fellow-citizens, was obliged to quit the city within ten days; for 6000 voices, at leaſt, were requiſite to baniſh an Athenian by the oſtraciſm.

The Athenians, without doubt, foreſaw the inconveniences to which this law was ſubject; but they choſe rather, as Cornelius Nepos hath remarked, ſometimes to expoſe the innocent to an unjuſt cenſure, than to live in continual alarms. Yet as they were ſenſible that the injuſtice of confounding virtue and vice would have been too flagrant, they ſoftened, as much as they could, the rigour of oſtraciſm. It was not aggravated with the circumſtances which were moſt diſhonourable and ſhocking in the ordinary mode of exile. They did not confiſcate the goods of thoſe who were baniſhed by oſtraciſm. They enjoyed the produce of their effects in the places into which they were baniſhed; and they were baniſhed only for a certain time. But in the common baniſhment, the goods of the exiles were always confiſcated, and no hopes were given them of ever returning to Athens.

The ſcholiaſt of Ariſtophanes informs us of a third difference betwixt oſtraciſm and the common baniſhment. He ſays, that a particular place of retirement was aſſigned to thoſe wh[illegible] baniſhed by oſtraciſm, which was not appoi[illegible]her exiles. We ſuſpect, however, the [illegible] of th[illegible]vation; [illegible] Themiſtocles was certainly not limited in his baniſhment. That great man, as we are told by Thucydides, tho' his chief reſidence was at Argi, travelled over all the Peloponneſus.

This puniſhment, far from conveying the idea of infamy, became, at Athens, a proof of merit, by the objects on which it was inflicted; as Ariſtides the ſophiſt juſtly obſerves, in his ſecond declamation againſt the Gorgias of Plato, where he ſays, that oſtraciſm was not an effect of the vindictive ſpirit of the people againſt thoſe whom it condemned, but the law, whether good or bad, (for he enters not into an examination of the queſtion), was only meant to prune the luxuriant growth of tranſcendent merit; that it condemned to an exile of ten years, only thoſe illuſtrious men who were accuſed of being exalted far above other citizens by their conſpicuous virtue; and that none of that public indignation was ſhown to the exiles by oſtraciſm, which commonly breaks out againſt criminals.

Such were the mitigations with which this law was introduced among the Athenians: and by them we ſee that they were ſenſible of all the inconveniences to which it was ſubject. They were indeed too enlightened a people, not to foreſee the many inſtances of injuſtice which it might produce; that [illegible] ſome reſpects it would be favourable to liberty, in others it would be its enemy, by condemning citizens without allowing them a previous defence, and by making a capricious and envious people arbiters of the fate of great men; that it might even become pernicious to the ſtate, by depriving it of its beſt ſubjects, and by rendering the adminiſtration of public affairs an odious employment to men of capital talents and virtue.

However great the inconveniences of oſtraciſm were, it would not have been impoſſible to avoid them; and we may add, that this law would have been of ſervice to the ſtate, if the people by whom it was inſtituted had always had diſcernment enough only to give it force on ſuch occaſions as endangered liberty. But its fate was like that of almoſt all other laws which the wiſeſt legiſlators have planned for the good of communities. Deſtined by their inſtitution to maintain order, to repreſs injuſtice, and to protect innocence, men have found ways to pervert their application, and have made them inſtruments to gratify their private paſſions. Thus oſtraciſm was eſtabliſhed to prevent the dangerous enterpriſes of the great, and to preſerve the vigour of the democracy; but the people of Athens, naturally jealous and envious, exerted that law, to remove men of eminent merit from the ſtate, by whoſe preſence they were reproved and intimidated. The fear of tyranny was commonly but a ſpecious pretext with which they veiled their malignity. The

Oſtracites
Oſtrea.

repeated victories which they had gained over the Perſians, had rendered them, ſays Plutarch, proud and inſolent. Intoxicated with their proſperity, they arrogated all its glory to themſelves; they were jealous of thoſe citizens whoſe political and military talents were the ſubjects of public eulogium. They thought the glory acquired by great men diminiſhed their own reputation. An Atheni[illegible]oner diſtinguiſhed himſelf by a ſplendid actio[illegible] marked out as a victim [illegible]blic e[illegible] reputation was a ſufficient reaſon for his baniſhment.

OSTRACITES, in natural hiſtory, a name uſed for the foſſile oyſters, common in many parts of England. They are of various ſhapes and kinds; and the name is by ſome authors made to ſignify the ſhell itſelf, when preſerved in its native ſtate and condition; as is the caſe with thoſe about Woolwich and Blackheath; and by others, the ſtones caſt or formed in thoſe ſhells, or in cavities, from whence they have been waſhed away and [illegible]; in both theſe caſes the ſtone carries the exact reſemblance of the ſhell, even in its niceſt lineaments; in the firſt caſe, bearing every mark of the inſide, in the other of the outer ſurface. We have this ſtone in great plenty in many parts of England; and it is very famous, in ſome places, for its virtues, in caſes of the gravel, and the like complaints.

OSTREA, the OYSTER, in zoology, a genus belonging to the order of vermes teſtacea. The ſhell has two unequal valves; the cardo has no teeth, but a ſmall hollowed one with tranſverſe lateral ſtreaks. There are 31 ſpecies, principally diſtinguiſhed by peculiarities in their ſhells. The common oyſter is reckoned an excellent food; and is eaten both raw and variouſly prepared. The character of the genus, in the words of Barbut, "The animal a tethys; the ſhell bivalve, unequivalve, with ſomething like ears; the hinge void of teeth, with a deep oval hole, and tranſverſe ſtreaks on the ſides There is no womb nor anus." The genus is divided into four families, of which oſtrea is the laſt. See PECTENS. The ſame author gives us the following enlarged account of the oyſter.

Plate CCCLXIX.

"This ſea-fiſh occupies in the ſcale of nature one of the degrees the moſt remote from perfection; deſtitute of defenſive weapons and progreſſive motion, without art or induſtry; it is reduced to mere vegetation in perpetual impriſonment, though it every day opens regularly to enjoy the element neceſſary to its preſervation. The animal figure, and the ſprings of its organization, are ſcarce diſcernible through the coarſe and ſhapeleſs maſs; a ligament placed at the ſummit of the ſhell ſerves as an arm to its operations. Oyſters are reputed to be hermaphrodites; the ſpawn which they caſt in May adheres to the rocks and other matters at the bottom of the ſea; and in the ſpace of 24 hours is provided with ſhells in which are contained other oyſters, that never leave the ſpot on which they were fixed, till the greedy fiſherman tears them from the element. The green oyſters eaten at Paris are commonly brought from Dieppe. Their colour is owing to the care taken to bed them in creeks, encompaſſed with verdure, where they acquire their delicacy. Common oyſters ſhould be freſh, tender, and moiſt. The moſt eſteemed are thoſe caught at the mouth of rivers, and in clear water. Great account is made of oyſters from Brittany, but ſtill greater of thoſe that come from Marennes in Saintonge. Preference is given to thoſe that are edged with ſmall brown fringe, or beard, which epicures call fecundated oyſters; but that thoſe are females is a miſtake. The want of freſh water renders oyſters hard, bitter, and unpalatable. Mud and ſea-weeds deſtroy them in their very birth; galangal root, muſcles, ſcollops, ſea ſtars, and crabs, are formidable enemies to the oyſter. There are found in Spain red and ruſſet coloured oyſters; in Illyria, brown coloured, with the fleſh black; and in the Red Sea, of the colour of the Iris. Oyſters of the mangle-tree are of two ſorts; thoſe of St Domingo are delicate, adhering to the ſtumps of the trees that dip in the water. The negro divers cut them off with a bill, and they are ſerved upon table with the roots."

Oſtrea.

Britain has been noted for oyſters from the time of Juvenal, who, ſatyrizing Montanus an epicure, ſays,

Circæis nata forent, an
Lucrinum ad ſaxum, Rutupinove edita fundo,
Oſtrea, callebat primo deprendere morſu.

He, whether Circe's rock his oyſters bore,
Or Lucrine lake, or diſtant Richborough's ſhore,
Knew at firſt taſte.

The luxurious Romans were very fond of this fiſh, and had their layers or ſtews for oyſters as we have at preſent. Sergius Orata was the firſt inventor, as early as the time of L. Craſſus the orator He did not make them for the ſake of indulging his appetite, but through avarice, and made great profits from them. Orata got great credit for his Lucrine oyſters; for, ſays Pliny, the Britiſh were not then known.

Pennant's Brit Zool vol iv. p 102.

The ancients ate them raw, having them carried up unopened, and generally eating them at the beginning of the entertainment, but ſometimes roaſted. They had alſo a cuſtom of ſtewing them with mallows, and docks, or with fiſh, and eſteemed them very nouriſhing.

Britain ſtill keeps its ſuperiority in oyſters over other countries. Moſt of our coaſts produce them naturally; and in ſuch places they are taken by dredging, and are become an article of commerce, both raw and pickled. The very ſhells, calcined, become an uſeful medicine as an abſorbent. In common with other ſhells, they prove an excellent manure.

Stews or layers of oyſters are formed in places which nature never allotted as habitations for them. Thoſe near Colcheſter have been long famous; at preſent there are others that at leaſt rival the former, near the mouth of the Thames. The oyſters, or their ſpats, are brought to convenient places, where they improve in taſte and ſize. It is an error to ſuppoſe, that the fine green obſerved in oyſters taken from artificial beds, is owing to copperas; it being notorious how deſtructive the ſubſtance or the ſolution of it is to all fiſh. We cannot give a better account of the cauſe, or of the whole treatment of oyſters, than what is preſerved in the learned biſhop Sprat's hiſtory of the Royal Society, from p. 307 to 309.

"In the mouth of May the oyſters caſt their ſpawn, (which the dredgers call their *ſpats*): it is like to a drop of candle, and about the bigneſs of a half-penny. The ſpat cleaves to ſtones, old oyſter-ſhells, pieces of wood, and ſuch like things, at the bottom of the ſea, which they call *cultch*. It is probably conjectured, that the ſpat in 24 hours begins to have a ſhell. In the month of May, the dredgers (by the law of the admiralty court) have liberty to catch all manner of oyſters, of what ſize ſoever. When they have taken them, with a knife they gently raiſe the ſmall brood from the clutch, and then they throw the clutch in again, to preſerve the ground for the future, unleſs they be ſo newly ſpat, that they cannot be ſafely ſevered from the cultch; in that caſe they are permitted to take the ſtone or ſhell, &c. that the ſpat is upon, one ſhell having many times 20 ſpats After the month of May, it is felony to carry away the cultch, and puniſhable to take any other oyſters, unleſs it be thoſe of ſize, (that is to ſay) about the bigneſs of an half-crown piece, or when, the two ſhells being ſhut, a fair ſhilling will rattle between them.

"The places where theſe oyſters are chiefly catched, are called the *Pent-Burnham*, *Malden*, and *Colne-waters*; the latter taking its name from the river of Colne, which paſſeth by Colcheſter, gives name to that town, and runs into a creek of the ſea, at a place called the *Hythe*, being the ſuburbs of the town. This brood and other oyſters they carry to the creeks of the ſea, at Brickelſea, Merſy, Langno, Lingrego, Wivenho, Toleſbury, and Saltcoaſe, and there throw them into the channel, which they call their *beds* or *layers*, where they grow and fatten; and in two or three years the ſmalleſt brood will be oyſters of the ſize aforeſaid. Thoſe oyſters which they would have green, they put into pits about three feet deep in the ſalt marſhes, which are overflowed only at ſpring-tides, to which they have ſluices, and let out the ſalt water until it is about a foot and a half deep. Theſe pits, from ſome quality in the ſoil co-operating with the heat of the ſun, will become green, and communicate their colour to the oyſters that are put into them in four or five days, though they commonly let them continue there ſix weeks or two months, in which time they will be of a dark green. To prove that the ſun operates in the greening, Toleſbury pits will green only in ſummer; but that the earth hath the greater power, Brickelſea pits green both winter and ſummer: and for a further proof, a pit within a foot of a greening pit will not green; and thoſe that did green very well, will in time loſe their quality. The oyſters, when the tide comes in, lie with their hollow ſhell downwards; and when it goes out, they turn on the other ſide: they remove not from their place, unleſs in cold weather, to cover themſelves in the ouſe. The reaſon of the ſcarcity of oyſters, and conſequently of their dearneſs, is, becauſe they are of late years bought up by the Dutch.

"There are great penalties by the admiralty court laid upon thoſe that fiſh out of thoſe grounds which the court appoints, or that deſtroy the cultch, or that take any oyſters that are not of ſize, or that do not tread under their feet, or throw upon the ſhore, a fiſh which they call a *five finger*, reſembling a ſpur-rowl, becauſe that fiſh gets into the oyſters when they gape, and ſucks them out.

"The reaſon that ſuch a penalty is ſet upon any that ſhall deſtroy the cultch, is, becauſe they find that if that be taken away, the ouſe will increaſe, and the muſcles and cockles will breed there, and deſtroy the oyſters, they having not whereon to ſtick their ſpat.

"The oyſters are ſick after they have ſpat; but in June and July they begin to mend, and in Auguſt they are perfectly well; [illegible] oyſter is black-ſick, having a black ſubſtan[illegible] the female white-ſick (as they term it, having [illegible] ſubſtance in the fin. They are ſalt in the pits, [illegible] in the layers, but ſalteſt at ſea."

The oyſter affords the curious in microſcopic obſervations a very pleaſing entertainment. In the clear liquor many little round living animalcules have been found, whoſe bodies being conjoined, form ſpherical figures, with tails, not changing their place otherwiſe than by ſinking to the bottom, as being heavier than the fluid; theſe have been ſeen frequently ſeparating, and then coming together again. In other oyſters, animalcules of the ſame kind were found, not conjoined, but ſwimming by one another, whence they ſeemed in a more perfect ſtate, and were judged by Mr Leeuwenhoek to be the animalcules in the roe or ſemen of the oyſter.

A female oyſter being opened, incredible multitudes of ſmall embryo oyſters were ſeen, covered with little ſhells, perfectly tranſparent, and ſwimming along ſlowly in the liquor; and in another female, the young ones were found of a browner colour, and without any appearance of life or motion.

Monſieur Joblot alſo kept the water running from oyſters three days, and it appeared full of young oyſters ſwimming about nimbly in it; theſe increaſed in ſize daily: but a mixture of wine, or the vapour of vinegar, killed them.

In the month of Auguſt oyſters are ſuppoſed to breed, becauſe young ones are then found in them. Mr Leeuwenhoek, on the 4th of Auguſt, opened an oyſter, and took out of it a prodigious number of minute oyſters, all alive, and ſwimming nimbly about in the liquor, by means of certain exceeding ſmall organs, extending a little way beyond their ſhells; and theſe he calls their beards. In theſe little oyſters, he could diſcover the joinings of the ſhells; and perceived that there were ſome dead ones, with their ſhells gaping. Theſe, though ſo extremely minute, are ſeen to be as like the large oyſters in form as one egg is to another.

As to the ſize of them, he computes, that 120 of them in a row would extend an inch; and conſequently, that a globular body, whoſe diameter is an inch, would, if they were alſo round, be equal to 1,728,000 of them. He reckons 3000 or 4000 are in one oyſter, and found many of the embryo oyſters among the bairds; ſome faſtened thereto by ſlender filaments, and others lying looſe: he likewiſe found animalcules in the liquor 500 times leſs than the embryo oyſters.

It is not very uncommon to ſee on oyſter-ſhells, when in a dark place, a ſhining matter or bluiſh light, like a flame of brimſtone, which ſticks to the fingers when touched, and continues ſhining and giving light for a conſiderable time, though without any ſenſible heat. This ſhining matter being examined with a microſcope, was found to conſiſt of three ſorts of animalcules;

cules; the firſt whitiſh, and having 24 or 25 legs on a ſide, forked, a black ſpeck on one part of the head, the back like an eel with the ſkin ſtripped off. The ſecond ſort, red, reſembling the common glow-worm, with folds on its back, but legs like the former; a noſe like a dog's, and one eye in the head. The third ſort, ſpeckled, with a head like a ſole, with many tufts of whitiſh hairs on th[illegible] of it. Some much larger and greyiſh might[illegible] having great heads, two horns like a ſna[illegible] ſix or eight whitiſh feet; but theſe did not ſeem to ſhine.

OSTRICH, in zoology. See Struthio.

OSTROVIZZA, in Dalmatia (ſee Dalmatia), which ſome would have the ſame as Arauzona, and others the Stlupi of the ancients, though probably it has no connection with either the one or the other. It was purchaſed in 1410 by the republic of Venice, for 50 0 ducats, and ſome pieces of land beſides. Its fortreſs, which was ſeated on a rock, perpendicularly cut all round, and deſervedly reckoned impregnable before the uſe of artillery, was taken by Soliman in 1524, but ſoon after returned under the dominion of Venice. At preſent, no traces of its fortification remain, and it is only a bare and iſolated maſs. There are ſome natural curioſities about the place.

OSTUNI, a town of Italy, in the kingdom of Naples, and in the Terra di Otranto, with a biſhop's ſee. Its territory is well cultivated, and abounds with olives and almonds. It is ſeated on a mountain near the Gulph of Venice, in E. Long. 17. 49. N. Lat. 49. 59

OSWEGO, a fort of North America, ſeated on the ſouth ſide of the lake Ontario, in W. Long. 70. 35. N. Lat. 45. 15.

OSW[illegible]ZEN, a town of Poland, in the palatinate of Cracovia, with the title of a duchy. It carries on a great trade in ſalt, and is ſeated on the river Viſtula. E. Long. 19. 47. N. Lat. 50. 1.

OSWESTRY, in the county of Salop, in England, 172 miles from London, is a very old town, with a caſtle, a wall, and a ditch, and was anciently a borough. It is a place celebrated in Saxon hiſtory and legendary piety. On this ſpot, Auguſt 5. 642, was fought the battle between the Chriſtian Oſwald king of the Northumbrians and the pagan Penda king of the Mercians, in which Oſwald was defeated, and loſt his life. The barbarian victor cut the body of the ſlain prince in pieces, and ſtuck them on ſtakes diſperſed over the field, as ſo many trophies; but, according to others, his head and hands only were thus expoſed. A prince ſo dear to the church as Oſwald, and ſo attached to the profeſſors of the monaſtic life, received every poſthumous honour they could beſtow. He was raiſed to the rank of a ſaint, and his ſanctity confirmed by numberleſs miracles, which are too numerous and too trifling to admit of particular deſcription. Its church, which is of no great antiquity, was formerly a monaſtery, and was called Blancminſter. It is, however, ſpacious, and has a handſome plain tower. In the years 1542 and 1567, this town ſuffered much by fire. It is governed by two bailiffs, burgeſſes, &c. and once drove a great trade in Welch cottons and flannels, which is now very much decayed. There is now ſcarce a tolerable houſe for travellers. But beſides a good grammar ſchool, it is noted for an excellent charity-ſchool for 40 boys, beſides girls, which has the beſt methods for exciting the emulation of the children in their learning; for 20 of the boys are ſet to ſtrive againſt 20 others for ſhoes, and the 20 who perform their taſk beſt have ſhoes firſt; then 10 of the boys are ſet againſt 10 others for the like premium, and ſo on till they are all ſhod: ſo in the girls ſchool a ſhift is put up for the beſt ſpinner, a head dreſs for the beſt ſempſtreſs, a pair of ſtockings for the beſt knitter, a Bible for the beſt reader, and a copy-book for the beſt writer. In the wall with which the town was fortified there were four gates. That called the *Block-gate* is demoliſhed; the New-gate, Willow-gate, and the Beatrice-gate, ſtill remain. The laſt is a handſome building, with a guard-room on both ſides. There are only two fragments of the caſtle remaining. It ſtood on an artificial mount, ſurrounded by a foſſe, extending to the Willow-gate.

OSYMANDES, a famous king of Egypt, was, according to ſome authors, the firſt monarch who collected a great number of books for the purpoſe of forming a library. To this curious collection he gave the title of *Pharmacy of the Soul*. Of all the monuments of the kings of Thebes, that of Oſymandes is one of the moſt magnificent. "He appears (ſays an elegant author) to have been a prince of great elegance and taſte in his day. Diodorus Siculus deſcribes many ſumptuous edifices erected by him; among thoſe edifices his palace or mauſoleum, whichſoever it was, has been eminently diſtinguiſhed for the paintings and ſculptures with which it was adorned. When we look to the ſubjects of thoſe works, we ſhall have reaſon to think that no man in any age could diſcover a fairer and more enlightened judgment than he did in the employment of the genius around him, which was not tamely devoted to dull or contracted objects, nor laviſhed on ſcenes of ſavage life, nor wholly engroſſed in alluſions to himſelf, but ſenſibly enlarged to a variety of contemplation which might become a great ſovereign; and in each of thoſe parts the ſubject was characteriſtically great.

Bromley's Hiſt of the Fine Arts, vol. 1.

"* In one place was repreſented, in a multitude of ſculptures, his expedition againſt the Bactrians, a people of Aſia, whom he had invaded with 400,000 foot, and 20,000 horſe, and whom he conquered. In another part was diſplayed the variety of fruits and productions, with which Pan, the great ſource of all things, had enriched the fertile land over which Oſymandes reigned. A third group of figures repreſented the monarch himſelf, as the high prieſt of the country, offering to the gods the gold and ſilver which he drew every year from the mines of Egypt. In another part of the edifice was exhibited, in an infinite number of figures, an aſſembly of judges, in the midſt of a great audience attentive to their deciſions; the preſident or chief of thoſe judges, ſurrounded by many books, wore on his breaſt a picture of Truth with her eyes ſhut—thoſe emphatic emblems, beyond which no age could go for the impreſſion of that wiſdom and impartiality which ought to prevail in adminiſtrative juſtice."

In ſhort, we cannot without aſtoniſhment read the account which Diodorus Siculus gives of the almoſt incredible magnificence of this prince, and of the immenſe ſums which he ſpent upon thoſe grand works.

* *Diod. Sic.* l. 1. p. 45. edit Rhodom.

Amongſt a variety of other ſurpriſing curioſities, was to be ſeen a ſtatue in the attitude of ſitting, which was the largeſt in all Egypt, the length of one of the feet being ſeven cubits. Not only the art of the ſculptor, but alſo the beauty of the ſtone, which was perfect in its kind, contributed to render this a maſter-piece of ſculpture. It bore the following inſcription: *I am OSYMANDES, king of kings; whoever will diſpute with me this title, let him ſurpaſs me in any of my works.*

Indeed (to uſe the words of the ſame elegant author quoted above) "the palace or mauſoleum of this accompliſhed prince muſt give us a ſtriking aſſurance of the progreſs which had been made in the arts at that time; whether he lived, as ſome have thought †, the immediate ſucceſſor of the firſt Buſiris, which was ſomewhat later than the period of Semiramis; or, as others have conceived ‡, ſubſequent to Seſoſtris, which would be 400 years later. Diodorus Siculus, who deſcribes that edifice, ſays nothing of the age in which Oſymandes lived; every opinion, therefore, on that point muſt be conjecture. We ſhall only remark, that there is nothing in the works of art in that edifice which ſhould appear too much for the earlieſt age in which that monarch has been placed, when we look back to what was done of thoſe works in a period full as early by Semiramis in Aſſyria."

† See *Rollin's Anc. Hiſt.*

‡ *Marſham*, p. 403. *Goguet*, vol ii. p. 141.

OTACOUSTIC INSTRUMENT, or *Auricular Tube*, an inſtrument to facilitate the hearing. See ACOUSTICS, nº 25.

OTAHEITEE, a celebrated iſland of the South ſea, ſituated in W. Long. 149. 13. S. Lat. 17. 46. It was diſcovered by Captain Wallis in 1767; afterwards Mr Bougainville touched here; and it was viſited by Captain Cook in 1773 and 1774, who had in 1769 ſailed round the iſland in a boat to obſerve the tranſit of Venus.

The iſland conſiſts of two diſtinct kingdoms, which are united by a narrow neck of land; the larger being called by the natives *Tiarrabou*, or *O-Taheitee-Nue*; the ſmaller one *Opoureonou*, or *O-Taheitee-Ete*. The circumference of both iſlands is about 40 leagues; the larger kingdom being divided into 43 diſtricts. The

1 Appearance of the country. country has a delightful romantic appearance. The coaſt, viewed from the ſea, preſents a moſt beautiful proſpect, being elevated like an amphitheatre. The iſland is ſkirted with a reef of rocks, and towards the ſea is level, being covered with fruit-trees of various kinds, particularly the cocoa nut. At the diſtance of about three miles from the ſhore, the country riſes into lofty hills that are covered with wood, and terminate in peaks, from which large rivers are precipitated into the ſea. The ſtones everywhere appear to have been burnt, not one being found which did not give manifeſt ſigns of fire; ſo that there is great reaſon for ſuppoſing that this and the neighbouring iſlands are either the ſhattered remains of a continent, or were torn from rocks, which from the creation of the world have been the bed of the ſea, and thrown up in heaps to a height which the waters never reach. What is rather extraordinary, the water does not gradually grow ſhallow as we approach the ſhore, but is of immenſe depth cloſe by the land; and the iſlands in this neighbourhood are almoſt everywhere ſurrounded by reefs which appear to be rude and broken in the manner that ſome violent concuſſion would naturally leave the ſolid ſubſtance of the earth; and Mr Forſter ſaw a rock with projecting longitudinal angles of black compact baſaltes. The exterior ranges of hills are ſometimes entirely barren, and contain a great quantity of yellowiſh clay, mixed with iron ochre; but others are covered with mould and wood like the mountains in the internal par[illegible] country. Pieces of quartz are ſometimes [illegible]; but no indications of precious min[illegible] any kind have been obſerved, iron only excepted.

Climate The air is extremely healthy and pleaſant; the heat is not troubleſome; and freſh meat will keep very well for two days, and fiſh one day. The winds do not blow conſtantly from the eaſt, but generally a little breeze from eaſt to ſouth-ſouth-eaſt. The tide riſes very little; and, being governed by the winds, is very uncertain. "The climate," ſays M. Bougainville, "is ſo healthy, that notwithſtanding the hard labour of the ſhips companies while on ſhore, though the men were continually in the water, and expoſed to the meridian ſun, though they ſlept upon the bare ſoil, and in the open air, none of them fell ſick; thoſe who were afflicted with the ſcurvy, and were ſent on ſhore, regained their ſtrength: although they were obliged to aſſiſt in the erecting of a fort, and had ſcarce one uninterrupted night, yet they were ſo far recovered in the ſhort ſpace of time they continued there, that they were afterwards perfectly cured on board."

3 High mountains. Notwithſtanding the great height of the inland mountains of Otaheitee, none of their rocks have the appearance of ba[illegible]s, every one of them being covered with wo[illegible] We hardly believed our eyes," ſays M. de Bo[illegible]inville, "when we ſaw a peak covered with woods [illegible] to its higheſt ſummit, w[illegible]ch riſes above the level [illegible] the mountains in the in[illegible] parts of the ſouthern quarter of this iſland. Its appar[illegible] ſize ſeemed to be more than 30 toiſes in diameter, and grew leſs in breadth as it roſe higher. At a diſtance it might have been taken for a pyramid of immenſe height, which the hand of an able ſculptor had adorned with garlands and foliage." One of the mates of the Dolphin, with a party of marines and ſeamen, penetrated into the interior parts of the iſland; and having aſcended, with great difficulty, a mountain which they ſuppoſed to be a mile high, they diſcovered mountains before them ſo much higher, that with reſpect to them they ſeemed to be in a valley: towards the ſea the view was enchanting, the ſides of the hills were beautifully clothed with wood, villages were everywhere interſperſed; and the valleys between them afforded a ſtill richer proſpect; the houſes ſtood thicker, and the verdure was more luxuriant; and Mr Forſter, with other gentlemen, aſcended to the ſummit of one of the higheſt mountains in the iſland, from whence they had a proſpect of the iſland of Huahine, and ſome others lying at the diſtance of 40 leagues; from which we may form ſome judgment of the prodigious height of that mountain. The view of the fertile plain below them, and of a river making innumerable meanders, was delightful in the higheſt degree. The vegetation on the upper part of the mountains was luxuriant, and the woods conſiſted of many unknown ſorts of trees and plants.

4 Soil and produce. The ſoil of this iſland is a rich fat earth, of a black-

iſh colour. It produces ſpontaneouſly, or with the ſlighteſt culture imaginable, a great variety of the moſt excellent fruits; ſuch as bread-fruit, cocoa-nuts, bananas of 13 ſorts, plantains, potatoes, yams, a fruit known here by the name of *jambu*, and reckoned moſt delicious; ſugar-canes, which the inhabitants eat raw; ginger; turmeric; a root of the ſalep kind, called by the inhabitants *pea*; a [illegible] called *ethee*, of which the root only is eaten; [illegible] grows in a pod like that of a large kidney-bean, by the natives called *abee*; a tree called *wharra*, which produces fruit ſomething like the pine-apple, and which is known in the Eaſt Indies by the name of *pandang*; a ſhrub called *nono*; the *morinda*, which alſo produces fruit; a ſpecies of fern; a plant called *theve*; and the Chineſe paper-mulberry, of the bark of which they make their cloth; an herb which the inhabitants eat raw, its flavour ſomewhat reſembling that of the Weſt India ſpinage called *calletoon*, but its leaf very different; a plant which the natives call *ava* [illegible], from the root of which they expreſs a liquor, which, if drank to exceſs, intoxicates like wine or diſtilled ſpirits. Here are a ſort of ſhady trees covered with a dark-green foliage, bearing golden-coloured apples, which, in juicineſs and flavour, reſemble the ananas or pine-apple. One of the moſt beautiful trees in the world received here the name of *Barringtonia*; it had a great abundance of flowers larger than lilies, and perfectly white, excepting the tips of their numerous chives, which were of a deep crimſon. Such a quantity of theſe flowers were ſeen dropped off, that the ground underneath the tree was entirely covered with them. The natives called the tree *huddow*; and ſaid, that the fruit, which is a large nut, when bruiſed and mixed up with ſome ſhell-fiſh, and thrown into the ſea, intoxicates the fiſh for ſome time, ſo that they come to the ſurface of the water, and ſuffer themſelves to be taken with people's hands. Several other maritime plants in tropical climates are found to have the ſame quality. Mr Dalrymple deſcribes the method of catching fiſh with theſe plants as follows: the plant is thruſt under the coral rocks or hollows where the fiſh haunt; the effect is moſt ſenſible in ſtill water, though it is effectual in the open ſea; for the ſame gentleman ſays, he has ſeen fiſh ſoon after float on the ſurface of the water half dead, and ſome totally without life; and where the effect is leſs violent, the fiſh will be ſeen under the water to have loſt their poiſe, without coming up to the ſurface. Fiſh caught in this manner are not in the leaſt noxious or ill taſted.

5
Animals.

In this iſland they have domeſtic poultry exactly reſembling thoſe of Europe: beſides which there are wild ducks; alſo beautiful green turtle doves; large pigeons of a deep blue plumage and excellent taſte; a ſmall ſort of paroquets, very ſingular on account of the various mixture of red and blue in their feathers; alſo another ſort of a greeniſh colour, with a few red ſpots; the latter are frequently tamed, and are valued on account of their red feathers. Here is a kingfiſher of a dark green, with a collar of the ſame hue round his white throat; a large cuckoo, and a blue heron. Small birds of various kinds dwell in the ſhady trees; and, contrary to the generally received opinion that birds in warm climates are not remarkable for their ſong, have a very agreeable note. There were no quadrupeds but dogs, hogs, and rats; and for theſe laſt the natives were ſaid to have a ſcrupulous regard, inſomuch that they would by no means kill them; however, Captain Cook, in 1773, turned about 14 cats on the iſland, which have probably reduced the number of theſe vermin. No frogs, toads, ſcorpions, centipedes, or any kind of ſerpent, have been found here; the ants, however are troubleſome, but not very numerous. When the Endeavour firſt arrived here in 1769, the flies were found exceſſively troubleſome; but muſquetto nets and fly-flaps in ſome meaſure removed the inconvenience. Sydney Parkinſon, in his journal, ſays, that notwithſtanding theſe flies are ſo great a nuiſance, the natives, from a religious principle, will not kill them. But there is a ſtrange diſagreement in the accounts of different voyagers concerning this matter. For M. Bougainville ſays, "this iſland is not infeſted with theſe myriads of troubleſome inſects that are the plague of other tropical countries." And Mr Forſter ſays, "not a gnat or muſquetto hummed unpleaſantly about us, or made us apprehenſive of its bite." This inconvenience muſt therefore be felt at certain ſeaſons of the year, and in certain diſtricts of the country, more ſenſibly than at other times and places. There is great variety of excellent fiſh; and according to Aitourou, a native who embarked with M. de Bougainville, there are ſea ſnakes on the ſhore of Otaheitee, whoſe bite is mortal.

6
Deſcription of the inhabitants, &c.

The inhabitants of Otaheitee are a ſtout, well made, active, and comely people. The ſtature of the men, in general, is from five feet ſeven to five feet ten inches; the talleſt man ſeen by Captain Wallis meaſured ſix feet three inches and a half; and Captain Cook, in his ſecond voyage, deſcribes O-Too, the king of Otaheitee, to be of that height. "In order to paint an Hercules or a Mars," ſays M. de Bougainville, "one could nowhere find ſuch beautiful models." They are of a pale brown complexion; in general their hair is black, and finely frizzled; they have black eyes, flat noſes, large mouths, and fine white teeth; the men wear their beard in many faſhions, all of them plucking out a great part, and have prominent bellies. Moſt of them ſmell ſtrong of the cocoa nut oil. The women in general are much ſmaller, eſpecially thoſe of the lower rank or tawtows, which is attributed to their early and promiſcuous intercourſe with the men; whilſt the better ſort, who do not gratify their paſſions in the ſame unbridled manner, are above the middle ſtature of Europeans. Their ſkin is moſt delicately ſmooth and ſoft: they have no colour in their cheeks; their noſe is generally ſomewhat flat, but their eyes are full of expreſſion, and their teeth beautifully even and white. "The women," ſays M. de Bougainville, "have features not leſs agreeable than the generality of Europeans, and a ſymmetry of body and beautiful proportion of limbs which might vie with any of them. The complexion of the men is tawny; but thoſe who go upon the water are much more red than thoſe who live on ſhore. Some have their hair brown, red, or flaxen, in which they are exceptions to all the natives of Aſia, Africa, and America, who have their hair black univerſally; here, in the children of both ſexes, it is generally flaxen. The ſtrongeſt expreſſion is painted in the countenances of theſe people; their walk is graceful, and all their motions are performed with great vigour and eaſe." "I never beheld ſtatelier men, (ſays Sydney Parkinſon.) The men of conſequence on the iſland wear the nails of their fingers long, which they conſider as a very honourable badge of diſtinction, ſince only ſuch people as have no occaſion to work can ſuffer them to grow to that length. This cuſtom they have in common with the Chineſe; but the nail of the middle finger on the right hand is always kept ſhort, the meaning for which peculiarity could not be learned. Only one ſingle cripple was met with among them, and he appeared to have been maimed by a fall. The women always cut their hair ſhort round their heads. Both ſexes have a cuſtom of ſtaining their bodies, which they call *tattowing*; both men and women have the hinder part of their thighs and loins marked very thick with black lines in various forms; theſe marks are made by ſtriking the teeth of an inſtrument ſomewhat like a comb juſt through the ſkin, and rubbing into the punctures a kind of paſte made of ſoot and oil, which leaves an indelible ſtain. The boys and girls under twelve years of age are not marked; a few of the men, whoſe legs were marked in chequers by the ſame method, appeared to be perſons of ſuperior rank and authority. Mr Banks ſaw the operation of tattowing performed upon the backſide of a girl about thirteen years old. The inſtrument uſed upon this occaſion had thirty teeth; and every ſtroke, of which at leaſt a hundred were made in a minute, drew an ichor or ſerum a little tinged with blood. The girl bore it with moſt ſtoical reſolution for about a quarter of an hour; but the pain of ſo many hundred punctures as ſhe had received in that time, then became intolerable. She firſt complained in murmurs, then wept, and at laſt burſt into loud lamentations, earneſtly imploring the operator to deſiſt. He was, however, inexorable; and when ſhe began to ſtruggle, ſhe was held down by two women, who ſometimes ſoothed and ſometimes chid her; and now and then, when ſhe was moſt unruly, gave her a ſmart blow. Mr Banks ſtaid in a neighbouring houſe an hour, and the operation was not over when he went away; yet it was performed but upon one ſide, the other having been done ſome time before; and the arches upon the loins, in which they moſt pride themſelves, and which gave more pain than all the reſt, were ſtill to be done. Both men and women are not only decently but gracefully clothed, in a kind of white cloth that is made of the bark of a ſhrub, and very much reſembles coarſe China paper. Their dreſs conſiſts of two pieces of this cloth; one of them, having a hole made in the middle to put the head through, hangs from the ſhoulders to the mid-leg before and behind; another piece, which is between four and five yards long, and about one yard broad, they wrap round the body in a very eaſy manner: This cloth is not woven; but is made like paper, of the macerated fibres of the inner bark ſpread out and beaten together. Their ornaments are feathers, flowers, pieces of ſhell, and pearls; the pearls are worn chiefly by the women. In wet weather they wear matting of different kinds, as their cloth will not bear wetting. The dreſs of the better ſort of women conſiſts of three or four pieces: one piece, about two yards wide and eleven long, they wrap ſeveral times round their waiſt, ſo as to hang down like a petticoat as low as the middle of the leg; and this they call *parou*. This ſimple drapery affords the ſex an opportunity of diſplaying an elegant figure to the greateſt advantage, according to the talents and taſte of the wearer: no general faſhions force them to disfigure inſtead of adorning themſelves, but an innate gracefulneſs is the companion of ſimplicity. To this cloth they give a very ſtrong perfume.

7 Of their houſes. The chief uſe w[illegible] of their houſes is to ſleep in them; for unleſs it [illegible]ey eat in the open air under the ſhade of a tree. Theſe houſes are no other than ſheds, all built in the wood between the ſea and the mountains; they are erected on an oblong ſquare; their width is nearly half of their length; they are nothing more than a roof, not quite four feet from the ground, raiſed on three rows of pillars, one row on each ſide, and one in the middle. The roof reſembles our thatched houſes in England, and conſiſts of two flat ſides inclining to each other. Their thatch conſiſts of palm-leaves. The flower of their dwelling is covered with hay, over which they ſpread mats. Some of theſe erections are furniſhed with a ſtool, which is appropriated ſolely to the uſe of the maſter of the family: they conſiſt of no other furniture except a few blocks of wood, which being ſquare, one ſide is hollowed into a curve; and theſe they uſe as pillows, and with their apparel they cover themſelves. In theſe open dwellings the whole family repoſe themſelves at night. The ſize of the houſe is proportioned to the number that conſtitutes the family. The eſtabliſhed order in theſe dormitories is, for the maſter and his wife to ſleep in the middle; round them the married people; in the next circle the unmarried women; and in the next, at the ſame diſtance, the unmarried men; and the ſervants at the extremity of the ſhed; but in fair weather the latter ſleep in the open air. Some few dwellings, however, conſtructed for greater privacy, are entirely incloſed with walls of reeds, connected together with tranſverſe pieces of wood, ſo as to appear ſomewhat like large bird cages cloſely lined; in theſe houſes there is commonly a hole left for the entrance, which can be cloſed up with a board.

Their candles are made of the kernels of a kind of oily nut, which they ſtick one above another on a ſkewer that is thruſt through the middle of them; the upper one being lighted burns to the ſecond, at the ſame time conſuming that part of the ſkewer that goes through it; the ſecond taking fire burns in the ſame manner down to the third, and ſo to the laſt; they burn a conſiderable time, and afford a pretty good light. The natives generally retire to reſt about an hour after it is dark.

8 Food, method of cookery. The food of the common people entirely conſiſts of vegetables. Theſe are, the bread-fruit, with bananas, plantains, yams, apples, and a ſour fruit, which, though not pleaſant by itſelf, gives an agreeable reliſh to roaſted bread-fruit, with which it is frequently beaten up: (See the article *Bread Tree*). The fleſh, which is reſerved for the tables of the great, is either poultry, hogs, or dogs; the fleſh of their fowls is not well-taſted, but that of dogs is eſteemed by the natives beyond pork. The ſmaller fiſh are generally eaten raw, as we eat oyſters: every thing that can be procured from the ſea is made an article of their food; for they will eat not only ſea-inſects, but what the ſeamen call *blubbers*,

blubbers, though ſome of them are ſo tough that they are obliged to ſuffer them to become putrid before they can be chewed. A very large ſhark being caught by the Dolphin's people was given to the natives; who ſoon cut it to pieces, and carried it away with great ſatisfaction.

They kill the animals they intend for food by ſuffocating them, which is done by ſtopping the mouth and noſe with their [illegible] then ſinge off the hair, by holding the animal over a fire, and ſcraping him with a ſhell: with this inſtrument they cut him up, and take out the entrails; which are waſhed, and put into cocoa-nut ſhells, together with the blood. Dogs are eaten that are fed wholly upon bread-fruit, cocoa-nuts, yams, and other vegetables, and are never ſuffered to taſte any animal food; and thoſe who have taſted the fleſh of a dog thus fed, have declared it to be little inferior to Engliſh lamb. In order to dreſs their food, they kindle a fire, by rubbing the end of one piece of dry wood upon the ſide of another, in the manner as a carpenter with us whets a chiſel. They then dig a pit about half a foot deep, and two or three yards in circumference; they pave the bottom with large pebble ſtones, which they lay down very ſmooth and even, and then kindle a fire in it with dry wood, leaves, and the huſks of cocoa-nuts. When the ſtones are ſufficiently heated, they take out the embers, and rake up the aſhes on every ſide; they then cover the ſtones with a layer of green cocoa-nut leaves, and wrap up the animal that is to be dreſſed in the leaves of the plantain. If it is a ſmall hog, they wrap it up whole; if a large one, they ſplit it. When it is placed in the pit, they cover it with the hot embers, and lay upon them bread-fruit and yams, which are alſo wrapped up in the leaves of plantain. Over theſe they ſpread the remainder of the embers, mixing among them ſome of the hot ſtones, with more cocoa-nut tree leaves upon them, and then cloſe up all with earth, ſo that the heat is kept in; the oven is kept thus cloſed a longer or ſhorter time according to the ſize of the meat that is dreſſed. The meat, when taken out, is ſaid to be better dreſſed than any other way. They uſe ſhells for knives; and carve very dexterouſly with them, always cutting from themſelves. One of the principal attendants on Oberea, attempting the uſe of the knife and fork, could not feed himſelf therewith; but by the mere force of habit, his hand came to his mouth, and the victuals at the end of his fork went away to his ear.

They are quite unacquainted with the method of boiling water, as they leave no veſſels among them that will bear the fire. Whilſt the noble Oberea was one morning at breakfaſt with Captain Wallis on board the Dolphin, the ſurgeon filled the tea-pot by turning the cock of a vaſe that ſtood upon the table. One of the lady's attendants obſerved this practice very attentively, and ſoon after turning the cock himſelf, received the water upon his hand; he no ſooner felt himſelf ſcalded, than he roared and danced about in an extravagant manner. The other Indians, unappriſed of the cauſe of theſe emotions, ſtood gazing at him in amazement, and not without ſome mixture of terror: but the gentlemen in company, who ſoon perceived the cauſe of the outcry, diſpelled the apprehenſions of their viſitants; and ſome ointment being applied to the ſcald, good humour and confidence were again reſtored. The gunner of the ſhip, who was appointed comptroller of the market which was eſtabliſhed on ſhore with the natives, uſed to dine on the ſpot; the aſtoniſhment of theſe people was very great to ſee him dreſs his pork and poultry in a pot; at length an old man, who was extremely ſerviceable in bringing down proviſions to be exchanged, was put into poſſeſſion of an iron pot, and from that time he and his friends ate boiled meat every day. Several iron pots were likewiſe given to Oberea and ſome of the chiefs; which were in conſtant uſe, and drew every body to ſee them; but although the particulars of two ſucceſſive voyages of Captain Cook to this iſland are circumſtantially related, we hear no more of this improvement in the culinary art, or of the further aſſiſtance which has been rendered thoſe people in ſupplying them with pots for boiling; but however deſirous the natives might be to eat boiled meat, it was not adviſable to have ſuch an article of barter as iron kettles, when a few ſpike nails, or a common hatchet, would procure one of their largeſt hogs.

Salt water is the uſual ſauce to their food; thoſe who live near the ſea have it furniſhed as it is wanted, others at a diſtance keep it in large bamboos. The kernels of the cocoa-nuts furniſh them with another ſauce: theſe, made into a paſte ſomething of the conſiſtence of butter, are beat up with ſalt water, which has a very ſtrong flavour; but though at firſt it ſeemed very nauſeous, yet when the taſte became familiar, it was much reliſhed.

Their general drink is water, or the milk of the cocoa-nut. They ſhowed in general an averſion to ſtrong liquors; and whenever any one of them happened to drink ſo freely with any of the ſhip's company as to be intoxicated, he reſolutely refuſed to taſte any thing that was likely to produce the ſame effect again; but they have a plant which they call ava ava, from the root of which they procure a liquor which has an inebriating quality. Their manner of preparing this ſtrong drink is as ſimple as it is diſguſting to an European. Several of the people take ſome of the root, and chew it till it is ſoft and pulpy; they then ſpit it out into a platter or other veſſel, every one into the ſame: into this general receptacle water is poured according to the quantity prepared. The juice thus diluted is ſtrained through ſome fibrous ſtuff like fine ſhavings, after which it is fit for drinking, and it is always prepared for preſent uſe: it has a pepperiſh taſte; drinks flat, and rather inſipid; and though it intoxicates, yet Captain Cook ſaw but one inſtance where it had that effect, as the natives generally drink it with great moderation, and but little at a time. Sometimes they chew this root as Europeans do tobacco, and ſometimes they will eat it wholly.

They eat alone, or at leaſt only in company with a gueſt that happens to call in; and the men and women never ſit down together to a meal: the ſhade of a ſpreading tree ſerves them for a parlour; broad leaves ſpread in great abundance ſerve for a table cloth; and if a perſon of rank, he is attended by a number of ſervants who ſeat themſelves round him: before he begins his meal, he waſhes his mouth and hands very clean, and repeats this ſeveral times whilſt he is eating. The

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quantity of food which theſe people eat at a meal is prodigious. Captain Cook ſays, he has ſeen one man devour two or three fiſhes as big as a pearch; three bread-fruits, each bigger than two fiſts; 14 or 15 plantains, or bananas, each ſix or ſeven inches long and four or five round, and near a quart of the pounded bread-fruit. Men of rank are conſtantly fed by their women; and one of the chiefs who dined on board the ſhips in 1769, ſhowed ſuch reluctance to feed himſelf, that one of the ſervants was obliged to feed him to prevent his returning without his meal In one of the excurſions which the gentlemen of the ſhips made into the country in 1773, they arrived at a neat houſe, where a very fat man, who ſeemed to be a chief of the diſtrict, was lolling on his wooden pillow; before him two ſervants were preparing his deſert, by beating up with water ſome bread-fruit and bananas in a large wooden bowl, and mixing with it a quantity of fermented ſour paſte called *mahie*. While this was doing, woman, who ſat down near him, crammed down his throat by handfuls the remains of a large baked fiſh, and ſeveral bread-fruits, which he ſwallowed with a voracious appetite: his countenance was the picture of phlegmatic inſenſibility, and ſeemed to teſtify that all his thoughts centered in the gratification of his appetite. He ſcarce deigned to look at the ſtrangers; and a few monoſyllables which he uttered, were extorted from him to remind his feeders of their duty, when by gazing at them they grew leſs attentive to him.

That theſe people, who are remarkably fond of ſociety, and particularly that of their women, ſhould exclude its pleaſures from the table, where, among all other nations, whether civil or ſavage, they have been principally enjoyed, is truly inexplicable. How a meal, which everywhere elſe brings families and friends together, comes to ſeparate them here, was a ſingularity much inquired about, but never accounted for. "They ate alone (they ſaid), becauſe it was right;" but why it was right to eat alone, they never attempted to explain. Such, however, was the force of habit in this inſtance, as it is in every other, that they expreſſed the ſtrongeſt diſlike, and even diſguſt, at their viſitants eating in ſociety, eſpecially with women, and of the ſame victuals. "At firſt (ſays Captain Cook) we thought this ſtrange ſingularity aroſe from ſome ſuperſtitious opinion; but they conſtantly affirmed the contrary. We obſerved alſo ſome caprices in the cuſtom, for which we could as little account as the cuſtom itſelf. We could never prevail with any of the women to partake of the victuals at our table, when we were dining in company; yet they would go five or ſix together into the ſervants apartments, and there eat very heartily of whatever they could find: nor were they in the leaſt diſconcerted if we came in while they were doing it. When any of us have been alone with a woman, ſhe has ſometimes eaten in our company; but then ſhe has expreſſed the great unwillingneſs that it ſhould be known, and always extorted the ſtrongeſt promiſes of ſecrecy. Among themſelves, even two brothers and two ſiſters have each their ſeparate baſkets of proviſions, and the apparatus of their meal. When they firſt viſited us at our tents, each brought his baſket with him; and when we ſat down to table, they would go out, ſit down upon the ground, at two or three yards diſtance from each other, and turning their faces different ways take their repaſt without exchanging a ſingle word. The women not only abſtain from eating with the men, and of the ſame victuals, but even have their victuals ſeparately prepared by boys kept for that purpoſe, who depoſit it in a ſeparate ſhed, and attend them with it at their meals. But though they would not eat with us, or with each other, they have oft[illegible] us to eat with them, when we have viſi[illegible] whom we were particularly acquainted [illegible] their ho[illegible] and we have often upon ſuch occaſions eaten ou[illegible] the ſame baſket, and drank out of the ſame cup. The elder women, however, always appeared offended at this liberty; and if we happened [illegible] touch their victuals, or even the baſket that contained it, they would throw it away.

After meals, and in the heat of the day, the middle-aged people of the better ſort generally ſleep. They are indeed extremely indolent; and ſleeping and eating are almoſt all that they do. Thoſe that are older are leſs drowſy, and the boys and girls are kept awake by the natural activity and ſprightlineſs of their age.

Theſe iſlanders, who inhabit huts expoſed to all the winds, and hardly cover the earth, which ſerves them for a bed, with a layer of leaves, are remarkably healthy and vigorous, and live to an old age without enduring any of its infirmities; their ſenſes are acute, and they retain their beautiful teeth to the laſt. M. de Bougainville deſcribes an old man, whom they ſaw on their landing, who had no other character of old age, than that reſpectable one which is imprinted on a fine figure. His head was adorned with white hair, and a long white beard; all his body was nervous and fleſhy; he had neither wrinkles, nor ſhowed any other tokens of decrepitude. This venerable man ſeemed diſpleaſed at the arrival of theſe ſtrangers; he even retired without making any returns to the courteſies they paid to him; but he gave no ſigns either of fear, aſtoniſhment, or curioſity: very far from taking any part in the raptures which the multitude expreſſed, his thoughtful and ſuſpicious air ſeemed to indicate, that he feared the arrival of a new race of men would interrupt the happineſs he had ſo long enjoyed. From whence it may be inferred, that his mind was not a whit more impaired than his body. There are, however, ſeveral ſorts of leprous complaints on this iſland, which appear in cutaneous eruptions of the ſcaly kind; ſome were ſeen that had ulcers upon different parts of their bodies: yet they ſeemed little regarded by thoſe who were afflicted with them, and no application whatever was uſed to them, not ſo much as to keep off the flies. But inſtances of them are rare, as the excellency of their climate, and the ſimplicity of their vegetable food, prevent almoſt all dangerous and deadly diſorders. They are ſometimes afflicted with the cholic, and coughs are not unknown among them; and the chiefs, who fare more ſumptuouſly, as a puniſhment for their voluptuouſneſs are ſometimes attacked with a diſorder ſimilar to the gout, in which the legs are ſwelled and exceſſively painful. M. de Bougainville's ſurgeon aſſured him, that he had ſeen many with marks of the ſmall-pox.

The uſual method employed here to reſtore the ſick to health, is by pronouncing a ſet form of words; after which the exorciſt applies the leaves of the cocoa-tree plaited to the fingers and toes of the ſick; ſo that nature is left to conflict with the diſeaſe, without being aſſiſted with any ſalutary application of art. But tho' they ſeem utterly deſtitute of medical knowledge, they appear to be no inconſiderable proficients in ſurgery, which they had an opportunity of proving while the Dolphin lay here. One [illegible]amen, when on ſhore, ran a large ſplinter in[illegible]d the ſurgeon not being at hand, one [illegible] his comrades endeavoured to take it out with a [illegible]n-knife: but after putting the poor fellow to a great deal of pain, he was obliged to give it over: an old native, who had been very active and ſucceſsful in eſtabliſhing a good underſtanding between the ſhip's company and his countrymen, happening to be preſent, called a man from the other ſide of the river, who having examined the lacerated foot, fetched a ſhell from the beach, which he broke to a point with his teeth; with which inſtrument he laid open the wound, and extracted the ſplinter. Whilſt this operation was performing, the old man went a little way into the wood, and returned with ſome gum, which he applied to the wound upon a piece of the cloth that was wrapped round him, and in two days time it was perfectly healed. This gum was produced by the apple-tree; the ſurgeon of the ſhip procured ſome of it, and uſed it as a vulnerary balſam with great ſucceſs. Captain Cook, in 1769, ſaw many of the natives with dreadful ſcars; one man, in particular, whoſe face was almoſt entirely deſtroyed; his noſe, including bone, was perfectly flat; and one cheek and one eye were ſo beaten in, that the hollow would almoſt receive a man's fiſt; yet no one ulcer remained.

The venereal diſeaſe is ſaid to have been entailed upon theſe people by the crew of M. de Bougainville's ſhips, who viſited this iſland a ſhort time after Captain Wallis had left it. In 1769, more than one-half of the crew in Captain Cook's ſhip had contracted it, during a month's ſtay here. The natives diſtinguiſhed it by a name of the ſame import with rottenneſs, but of a more extenſive ſignification. They deſcribed, in the moſt pathetic terms, the ſufferings which the firſt victims to its rage endured; and told him that it cauſed the hair and the nails to fall off, and the fleſh to rot from the bones; that it ſpread an univerſal terror and conſternation among the inhabitants, ſo that the ſick were abandoned by their neareſt relations, leſt the calamity ſhould ſpread by contagion, and were left to periſh alone in ſuch miſery as till then had never been known among them. But there ſeems to be ſome reaſon to hope that they had found out a ſpecific cure for it, as none were ſeen on whom it had made a great progreſs; and one who went from the ſhip infected, returned, after a ſhort time, in perfect health. Both Captain Cook and Mr Forſter, in their relations of their voyage in the Reſolution, endeavour to eſtabliſh the opinion, that this ſcourge of licentiouſneſs was felt in the South Sea iſlands previous to any of the modern voyages that have been made thither, and that it was an indigenous diſeaſe there. But if that concluſion is well founded, how comes it, that at all the places where the Reſolution touched in 1773, which had before been viſited by the Endeavour in 1769, ſuch as New Zealand for inſtance, the crew, more or leſs, became infected by their commerce with the women, and not at all ſo at places which they viſited, for the firſt time, in the Reſolution?

10 Manufactures.

The principal manufactures among the Otaheiteans is their cloth. This is made of the bark of trees, which are of three kinds, *viz.* the Chineſe mulberry-tree, or *aouta*; the bread-fruit tree, or *ooroo*; and one that is deſcribed by Dr Hawkeſworth as reſembling the wild fig tree of the Weſt Indies. Of all theſe the paper mulberry affords the beſt cloth; what is made from that being both finer, ſofter, whiter, and better ſuited to take a colour; the *ooroo* produces cloth much inferior in contexture; and the laſt is very coarſe, in colour reſembling the darkeſt brown paper; but this laſt is the only kind that withſtands water: (See the article Bark.)—They likewiſe prepare a red dye; which is made by mixing the yellow juice of a ſmall ſpecies of fig, which the natives call *mattee*, with the greeniſh juice of a ſort of fern or bindweed, or of ſeveral other plants, which produce a bright crimſon: and this the women rub with their hands, if the piece is to be uniformly of a colour; or they make uſe of a bamboo reed if the piece is to be marked or ſprinkled into different patterns. The colour fades very ſoon, and becomes of a dirty red; but notwithſtanding this defect, and its being liable to be ſpoiled by rain, the cloth thus ſtained is highly valued, and is worn only by the principal inhabitants of the country. The inhabitants perfume their clothes with certain plants; concerning which, Mr Forſter made all poſſible inquiry. Tahea, a friendly native, ſhowed him ſeveral plants which are ſometimes uſed as ſubſtitutes; but the moſt precious ſort, he either could not, or would not, point out: and from the account of Omai it appears that there are no leſs than 14 different ſorts of plants employed for this purpoſe.

Matting is another Otaheitean manufacture: and in this they are ſo dexterous, that they produce finer mats than any made in Europe. Ruſhes, graſs, the bark of trees, and the leaves of a plant called *wharrou*, are the materials which they work up for this purpoſe. Their matting is applied to various uſes: the coarſer kind is employed for ſleeping on in the night, or ſitting on through the day; the finer ſort is converted into garments in rainy weather, their cloth being ſoon penetrated by wet. They are very dexterous in making baſket and wicker-work: their baſkets are of a vaſt number of different patterns, many of them exceedingly neat; and the making them is an art practiſed by every one, both men and women.

Inſtead of hemp, they make ropes and lines of the bark of a tree; and thus they are provided with fiſhing nets; the fibres of the cocoa-nut furniſh them with thread, with which they faſten the different parts of their canoes, &c. The bark of a nettle which grows in the mountains, and is called *orawa*, ſupplies them with excellent fiſhing lines, capable of holding any kind of fiſh; and their hooks are made of mother-of-pearl, to which they fix a tuft of hair, made to reſemble the tail of a fiſh. Inſtead of making them bearded, the point is turned inwards. They make alſo a kind of ſeine of a coarſe broad graſs, the blades of which are like flags. Theſe they twiſt and tie together in a looſe manner, till the net, which is about as wide as a large ſack, is from 60 to 80 fathoms long.

This they haul in ſmooth ſhoal water; and its own weight keeps it ſo cloſe to the ground, that ſcarcely a ſingle fiſh can eſcape They make harpoons of cane, and point them with hard wood; with which they can ſtrike fiſh more effectually than an European can with one headed with iron

11 Working tools. The tools uſed by the Otaheiteans for all their purpoſes are, an adze made of ſtone; a chiſel or gouge made of bone, generally the bone of a man's arm between the wriſt and elbow; a raſp of coral, and the ſkin of a ſting-ray; alſo coral and ſand, as a file or poliſher: and with theſe they fell timber, cleave and poliſh it, and hew ſtone. The ſtone which makes the blade of their adzes is a kind of baſaltes, of a grey or blackiſh colour, not very hard, but of conſiderable toughneſs; they are formed of different ſizes; ſome that are intended for felling, weigh from ſix to eight pounds; others that are uſed for carving, not more than as many ounces: but it is neceſſary to ſharpen theſe rude tools almoſt every minute; for which purpoſe a cocoa-nut ſhell full of water and a ſtone are always at hand. With ſuch tools they generally take up ſeveral days in felling a tree; but after it is down, and ſplit into planks, they ſmooth them very dexterouſly and expeditiouſly with their adzes, and can take off a thin coat from a whole plank without miſſing a ſtroke.

12 Weapons. Their weapons are ſlings, which they uſe with great dexterity; pikes headed with the ſkins of ſting-rays; and clubs of about ſix or ſeven feet long, made of a very hard wood. Thus armed, they are ſaid to fight with great obſtinacy; and to give no quarter to man, woman, or child, who happens to fall into their hands during the battle, nor for ſome time afterwards, till their paſſion ſubſides. They have likewiſe bows and arrows; but the arrows are good for nothing except to bring down a bird, being headed only with ſtone, and none of them pointed. They have targets of a ſemicircular form, made of wicker-work, and plaited ſtrings of the cocoa-nut fibres, covered with gloſſy, bluiſh-green feathers belonging to a kind of pigeon, and ornamented with many ſhark's-teeth, arranged in three concentric circles.

13 Canoes. Their boats or canoes are of three different ſorts. Some are made out of a ſingle tree, and hold from two to ſix men. Theſe are principally employed in fiſhing: the others are conſtructed of planks very dexterouſly ſewed together; they are of different ſizes, and will hold from 10 to 40 men: they generally laſh two of theſe together, and ſet up two maſts between them; or if they are ſingle, they have an outrigger on one ſide, and only one maſt in the middle and in theſe veſſels they will ſail far beyond the ſight of land The third ſort ſeems to be principally deſigned for pleaſure or ſhew. Theſe are very large, but have no ſail; and in ſhape reſemble the gondolas of Venice. The middle is covered with a large awning; and ſome of the people ſit upon it, and ſome under it. The plank of which theſe veſſels are conſtructed, is made by ſpliting a tree, with the grain, into as many thin pieces as poſſible. The boards are brought to the thickneſs of about an inch, and are afterwards fitted to the boat with the ſame exactneſs that might be expected from an expert joiner. To faſten theſe planks together, holes are bored with a piece of bone, fixed into a ſtick for that purpoſe. Through theſe holes a kind of plaited cordage is paſſed, ſo as to hold the planks ſtrongly together. The ſeams are caulked with dry ruſhes; and the whole outſide of the veſſel is painted over with a kind of gummy juice, which ſupplies the place of pitch.

14 Character, manners, &c. The Otaheiteans are a very induſtrious people, and friendly in their diſpoſitions, but like all other nations not fully civilized, their paſſions are extremely violent, and they are very fickle. The manner of ſingling out a man here for a choſen friend is by taking off a part of your clothing and putting it upon him. Their uſual manner of expreſſing their reſpect to ſtrangers, or their ſuperiors, at a firſt meeting, is by uncovering themſelves to the middle. They have a cuſtom of ſaluting thoſe who ſneeze, by ſaying *evaroeia-t-eatoua*, "May the good eatoua awaken you," or "May not the evil eatoua lull you aſleep!"

Their propenſity to theft is very great, inſomuch, that M. Bougainville ſays, "even in Europe itſelf one cannot ſee more expert filchers than the people of this country;" and indeed, in all the voyages made by Captain Cook and others, they had abundant experience of this diſpoſition of the natives, which often produced quarrels, and ſometimes even fatal effects. In their behaviour they are extremely laſcivious, almoſt beyond credibility. A woman of diſtinction who viſited Mr Banks uſed the following ceremony on her firſt approach to the ſtranger. After laying down ſeveral young plantain-leaves, a man brought a large bundle of cloth; which having opened, he ſpread it piece by piece on the ground, in the ſpace between Mr Banks and his viſitants. There were in all nine pieces: having ſpread three pieces one upon another, the lady came forward, and, ſtepping upon them, took up her garments all around her to her waiſt; ſhe then turned three times round, after which ſhe dropped the veil: when other three pieces were ſpread, ſhe practiſed the ſame ceremony; and ſo the third time, when the laſt three pieces were laid out; after which the cloth was again rolled up, and delivered to Mr Banks as a preſent from the lady, who with her attending friend came up and ſaluted him. From the unbridled licentiouſneſs of theſe people, the French gave this iſland the name of the *New Cythera*. Nay, to ſuch a degree do they carry their libidinous exceſſes, that a number of t[illegible]cipal people, it is related, have formed themſelves into a ſociety, in which every woman is common to every man. This ſociety is diſtinguiſhed by the name of [illegible], the members of which have meetings from which all others are excluded. At theſe meetings the paſſions are excited by a ſtudied courſe of ſenſuality, and the coarſeſt and moſt brutal pleaſures are enjoyed by the whole company. If, however, notwithſtanding theſe exceſſes, any of the female members of this community ſhould prove with child, unleſs ſhe can procure ſome man to adopt the child as his own, not all the ſtrong affections of a mother, if ſuch are not entirely eradicated by a courſe of life ſubverſive of the feelings as well as the modeſty of nature, can ſave the life of the precondemned innocent; but the child as ſoon as born is ſmothered, and the mother is left at liberty to renew her former courſe of execrable proſtitution. Should any man be found to cooperate with a woman in ſaving the life of a child, they tee. are both excluded for ever from the *arreoy*, and are conſidered as man and wife. The woman from that time is diſtinguiſhed by the term *whannow-now*, "the bearer of children;" which in this part of the world only is conſidered as a term of reproach; and ſo depraved are thoſe people, that being a member of ſuch a ſociety is boaſted of as being a privilege, inſtead of being ſtigmatized as t' [illegible] crime. The arreoys enjoy ſeveral privile[illegible] and are greatly reſpected throughout the Society Iſlands, as well as at Otaheitee; nay, they claim a great ſhare of honour from the circumſtance of being childleſs. Tupia, one of the moſt intelligent natives, when he heard that the king of England had a numerous offspring, declared that he thought himſelf much greater, becauſe he belonged to the arreoys. That this ſociety indulge themſelves in promiſcuous embraces, and that every woman is common to every man, is contradicted by Mr Forſter. He ſays, that theſe arreoys chooſe their wives and miſtreſſes from among the proſtitutes; and from this circumſtance, as well as their extreme voluptuouſneſs, they have ſeldom any reaſon to dread the intruſion of children. He had the following circumſtances related to him by Omi or Omiah, one of the natives, who was brought to England. He ſaid, that the pre-eminence and advantages which a man enjoyed as arreoy were ſo valuable as to urge him againſt his own feelings to deſtroy his child; that the mother was never willing to conſent to the murder; but that her huſband and other arreoys perſuaded her to yield up the child; and that where entreaties were not ſufficient, force was ſometimes made uſe of. But, above all, he added, that this action was always perpetrated in ſecret; inſomuch, that not even the *totows* or attendants of the houſe were preſent; becauſe, if it were ſeen, the murderers would be put to death.

Both men and women conſtantly waſh their whole bodies three times a-day in running water, and are remarkably cleanly in their clothes. They are moſt expert ſwimmers, being accuſtomed to the water from their infancy. Captain Cook relates the following remarkable inſtance of their expertneſs. On a part of the ſhore where a tremendouſly high ſurf broke, inſo- [illegible] could live in it, and the [illegible]

thing [illegible] near them, they dived under it, and roſe again on the other ſide. The ſtern of an old canoe added much to their ſport. This they took out before them, and ſwam with it as far as the outermoſt breach; when two or three getting into it, and turning the ſquare end to the breaking wave, were driven in towards the ſhore with incredible rapidity, ſometimes almoſt to the beach; but generally the wave broke over them before they got half way; in which caſe they dived, and roſe to the other ſide with the canoe in their hands, and ſwimming out with it again, were again driven back. This amazing expertneſs drew the Captain's attention for more than half an hour; during which time none of the ſwimmers attempted to come aſhore, but ſeemed to enjoy the ſport in the higheſt degree. At another time, one of the officers of the quarter-deck intending to drop a bead into a canoe for a little boy of ſix years of age, it accidentally miſſed the boat, and fell into the ſea; but the child immediately leaped overboard, dived after it, and recovered it. To reward him for this feat, ſome more beads were dropped to him; which excited a number of men and women to amuſe the officers with their amazing feats of agility in the water, and not only fetched up ſeveral beads ſcattered at once, but likewiſe large nails, which, from their weight, deſcended quickly to a conſiderable depth. Some of theſe people continued a conſiderable time under water; and the velocity with which they were ſeen to go down, the water being extremely clear, was very ſurpriſing. Here a green branch of a tree is uſed as an emblem of peace, in exact conformity to the cuſtom of the ancient nations. We ſhall add an extract here from Captain Cook's laſt voyage to the Pacific Ocean.

Otaheitee.

"Nothing could make a ſtronger impreſſion at firſt ſight, on our arrival here, than the remarkable contraſt between the robuſt make and dark colour of the people of Tongataboo *, and a ſort of delicacy and whiteneſs which diſtinguiſh the inhabitants of Otaheitee. It was even ſome time before that difference could preponderate in favour of the Otaheiteans; and then only, perhaps, becauſe we became accuſtomed to them, the marks which had recommended the others began to be forgotten. Their women, however, ſtruck us as ſuperior in every reſpect; and as poſſeſſing all thoſe delicate characteriſtics which diſtinguiſh them from the other ſex in many countries. The beard which the men here wear long, and the hair, which is not cut ſo ſhort as is the faſhion at Tongataboo, made alſo a great difference; and we could not help thinking that on every occaſion they ſhowed a greater degree of timidity and fickleneſs. The muſcular appearance, ſo common amongſt the Friendly Iſlanders, and which ſeems a conſequence of their being accuſtomed to much action, is loſt here, where the ſuperior fertility of their country enables the inhabitants to lead a more indolent life; and its place is ſupplied by a plumpneſs and ſmoothneſs of the ſkin; which though perhaps more conſonant with our ideas of beauty, is no real advantage, as it ſeems attended with a kind of languor in all their motions, not obſervable in the others. This obſervation is fully verified in their [illegible] which may be called littl

"Perſonal endowments being in great eſteem amongſt them, they have recourſe to ſeveral methods of improving them, according to their notions of beauty. In particular, it is a practice, eſpecially amongſt the *Arreoy*, or unmarried men of ſome conſequence, to undergo a kind of phyſical operation, to render them fair. This is done by remaining a month or two in the houſe; during which time they wear a great quantity of clothes, eat nothing but bread fruit, to which they aſcribe a remarkable property in whitening them. They alſo ſpeak, as if their corpulence and colour, at other times, depended upon their food; as they are obliged, from the change of ſeaſons, to uſe different ſorts at different times.

"The graceful air and firm ſtep with which theſe people walk are not the leaſt obvious proof of their perſonal accompliſhments. They conſider this as a

* One of the Friendly Iſlands.

thing ſo natural, or ſo neceſſary to be acquired, that nothing uſed to excite their laughter ſooner, than to ſee us frequently ſtumbling upon the roots of trees, or other inequalities of the ground.

"Their countenances very remarkably expreſs the abundant mildneſs or good nature which they poſſeſs, and are entirely free from that ſavage keenneſs which marks nations in a barbarous ſtate. One would, indeed, be apt to fancy that they had been bred up under the ſevereſt reſtrictions to acquire an aſpect ſo ſettled, and ſuch a command of their paſſions, as well as ſteadineſs in conduct. But they are at the ſame time frank, cheerful, and good-humoured, though ſometimes, in the preſence of their chiefs, they put on a degree of gravity, and ſuch a ſerious air, as becomes ſtiff and aukward, and has an appearance of reſerve

Their peaceable diſpoſition is ſufficiently evinced from the friendly reception all ſtrangers have met with who have viſited them. Inſtead of offering to attack them openly or clandeſtinely, as has been the caſe with moſt of the inhabitants of theſe ſeas, they have never appeared in the ſmalleſt degree hoſtile, but on the contrary, like the moſt civized people, have courted an intercourſe with their viſitors by bartering, which is the only medium that unites all nations in a ſort of friendſhip. They underſtand barter (which they call *fukkatou*) ſo perfectly, that at firſt we imagined they might have acquired the knowledge of it by commercial intercourſe with the neighbouring iſlands; but we were afterwards aſſured, that they had little or no traffic except with Feejee, from which they get the red feathers, and ſome few other articles which they eſteem. Perhaps no nation in the world traffic with more honeſty, and leſs diſtruſt. We could always ſafely permit them to examine our goods, and to hand them about one to another; and they put the ſame confidence in us. If either party repented of the bargain, the goods were re-exchanged with mutual conſent and good-humour. Upon the whole, they ſeem poſſeſſed of many of the moſt excellent qualities that adorn the human mind, ſuch as induſtry, ingenuity, perſeverance, affability, and perhaps other virtues which our ſhort ſtay with them might prevent our obſerving.

"The only defect ſullying their character that we know of is their propenſity to thieving, to which we found thoſe of all ages and both ſexes addicted, and to an uncommon degree. It ſhould, however, be conſidered, that this exceptionable part of their conduct ſeemed to exiſt merely with reſpect to us; for in their general intercourſe with one another, I had reaſon to be of opinion, that thefts do not happen more frequently (perhaps leſs ſo) than in other countries, the diſhoneſt practices of whoſe worthleſs individuals are not ſuppoſed to authoriſe any indiſcriminate cenſure on the whole body of the people. Great allowances ſhould be made for the foibles of theſe poor natives of the Pacific Ocean, whoſe minds we overpowered with the glare of objects, equally new to them as they were captivating. Stealing, amongſt the civilized and enlightened nations of the world, may well be conſidered as denoting a character deeply ſtained with moral turpitude, with avarice unreſtrained by the known rules of right, and with profligacy producing extreme indigence, and neglecting the means of relieving it. But at the Friendly and other iſlands which we viſited, the thefts ſo frequently committed by the natives, of what we had brought along with us, may be fairly traced to leſs culpable motives. They ſeemed to ariſe ſolely from an intenſe curioſity or deſire to poſſeſs ſomething which they had not been accuſtomed to before, and belonging to a ſort of people ſo different from themſelves. And, perhaps, if it were poſſible that a ſet of beings ſeemingly as ſuperior in our judgment as we are in theirs ſhould appear amongſt us, it might be doubted, whether our natural regard to juſtice would be able to reſtrain many from falling into the ſame error. That I have aſſigned the true motive for their propenſity to this practice, appears from their ſtealing every thing indiſcriminately at firſt ſight, before they could have the leaſt conception of converting their prize to any one uſeful purpoſe. But I believe, with us, no perſon would forfeit his reputation, or expoſe himſelf to puniſhment, without knowing before-hand how to employ the ſtolen goods. Upon the whole, the pilfering diſpoſition of theſe iſlanders, though certainly diſagreeable and troubleſome to ſtrangers, was the means of affording us ſome information as to the quickneſs of their intellects. For their ſmall thefts were committed with much dexterity; and thoſe of greater conſequence with a plan or ſcheme ſuited to the importance of the objects. An extraordinary inſtance of the laſt ſort was, in their attempts to carry away one of the Diſcovery's anchors at mid-day.

Their common diet is made up of at leaſt nine-tenths of vegetable food; and I believe more particularly the *mahee*, or fermented bread-fruit, which makes part almoſt of every meal, has a remarkable effect upon them, preventing a coſtive habit, and producing a very ſenſible coolneſs about them, which could not be perceived in us who fed on animal food. And it is, perhaps, owing to this temperate courſe of life that they have ſo few diſeaſes among them. See n° 8.

"They only reckon five or ſix which might be called chronic, or national diſorders; amongſt which are the dropſy, and the *feſai*, or indolent ſwellings before mentioned, as frequent at Tongataboo. But this was before the arrival of the Europeans; for we have added to this ſhort catalogue a diſeaſe which abundantly ſupplies the place of all the others, and is now almoſt univerſal. For this they ſeem to have no effectual remedy. The prieſts, indeed, ſometimes give them a medley of ſimples, but they own that it never cures them. And yet they allow that in a few caſes nature, without the aſſiſtance of a phyſician, exterminates the poiſon of this fatal diſeaſe, and a perfect recovery is produced. They ſay, that if a man is infected with it he will often communicate it to others in the ſame houſe, by feeding out of the ſame utenſils, or handling them, and that, in this caſe, they frequently die, while he recovers; though we ſee no reaſon why this ſhould happen. See n° 9

Their behaviour on all occaſions ſeems to indicate a great openneſs and generoſity of diſpoſition. Omai, indeed, who, as their countryman, ſhould be ſuppoſed rather willing to conceal any of their defects, has often ſaid that they are ſometimes cruel in puniſhing their enemies. According to his repreſentation, they torment them very deliberately; at one time tearing out ſmall pieces of fleſh from different parts; at another taking out the eyes; then cutting off the noſe; and laſtly, killing them by opening the belly. But this only happens on particular occaſions. If cheerfulneſs argues a conſcious innocence, one would ſuppoſe that their life is ſeldom ſullied by crimes. This, however, I rather impute to their feelings, which, though lively, ſeem in no caſe permanent; for I never ſaw them in any misfortune labour under the appearance of anxiety after the critical moment was paſt. Neither does care ever ſeem to wrinkle their brow. On the contrary, even the approach of death does not appear to alter their uſual vivacity. I have ſeen them when brought to the brink of the grave by diſeaſe, and when preparing to go to battle; but in neither caſe ever obſerved their countenances overclouded with melancholy or ſerious reflection. Such a diſpoſition leads them to direct all their aims only to what can give them pleaſure and eaſe. Their amuſements all tend to excite and continue their amorous paſſions; and their ſongs, of which they are immoderately fond, anſwer the ſame purpoſe. But as a conſtant ſucceſſion of ſenſual enjoyments muſt cloy, we found that they frequently varied them to more refined ſubjects, and had much pleaſure in chanting their triumphs in war, and their occupations in peace; their travels to other iſlands and adventures there; and the peculiar beauties, and ſuperior advantages of their own iſland over the reſt, or of different parts of it over other leſs favourite diſtricts. This marks that they receive great delight from muſic; and though they rather expreſſed a diſlike to our complicated compoſitions, yet were they always delighted with the more melodious ſounds produced ſingly on our inſtruments, as approaching nearer to the ſimplicity of their own. Neither are they ſtrangers to the ſoothing effects produced by particular ſorts of motion, which in ſome caſes ſeem to allay any perturbation of mind with as much ſucceſs as muſic. Of this I met with a remarkable inſtance. For, on walking one day about Matavai Point, where our tents were erected, I ſaw a man paddling in a ſmall canoe ſo quickly, and looking about with ſuch eagerneſs on each ſide, as to command all my attention. At firſt I imagined that he had ſtolen ſomething from one of the ſhips, and was purſued; but on waiting patiently ſaw him repeat his amuſement. He went out from the ſhore till he was near the place where the ſwell begins to take its riſe; and, watching its firſt motion very attentively, paddled before it with great quickneſs till he found that it overtook him, and had acquired ſufficient force to carry his canoe before it, without paſſing underneath. He then ſat motionleſs, and was carried along at the ſame ſwift rate as the wave, till it landed him upon the beach. Then he ſtarted out, emptied his canoe, and went in ſearch of another ſwell. I could not help concluding, that this man felt the moſt ſupreme pleaſure, while he was driven on ſo faſt and ſo ſmoothly by the ſea; eſpecially as, though the tents and ſhips were ſo near, he did not ſeem in the leaſt to envy, or even to take any notice of, the crowds of his countrymen collected to view them as objects which were rare and curious. During my ſtay, two or three of the natives came up, who ſeemed to ſhare his felicity, and always called out when there was an appearance of a favourable ſwell, as he ſometimes miſſed it, by his back being turned, and looking about for it. By them I underſtood that this exerciſe, which is called *ehorooe*, was frequent amongſt them; and they have probably more amuſements of this ſort, which afford them at leaſt as much pleaſure as ſkaiting, which is the only one of ours with whoſe effects I could compare it."

15 Language, &c. The language of theſe iſlanders is ſoft and melodious; it abounds with vowels, and the pronunciation of it is eaſily acquired: but it was found exceſſively difficult to teach the natives to pronounce a ſingle Engliſh word; probably not only from its abounding with conſonants, but from ſome peculiarity in its ſtructure; for Spaniſh and Italian words, if ending in a vowel, they pronounced with the greateſt eaſe. A ſufficient acquaintance has not been formed with it to determine whether it is copious or not; but it is certainly very imperfect, being totally without inflexion either of nouns or verbs. Few of the nouns have more than one caſe, and few of the verbs more than one tenſe. It was impoſſible to teach the iſlanders to pronounce the names of their gueſts. They called Captain Cook *Toote*; Mr Hicks, the firſt lieutenant, *Hete*, &c. and in this manner they formed names for almoſt every man in the ſhip. In ſome, however, it was not eaſy to find any traces of the original; and they were perhaps not mere arbitrary ſounds formed upon the occaſion, but ſignified words in their own language; and it ſeems that they could perfectly remember theſe appellations at the diſtance of four years, by their inquiries after ſuch gentlemen as were abſent on the ſecond voyage by name. Mr Monkhouſe, a midſhipman, they called *Matte*, which in their language ſignifies *dead*; becauſe he commanded a party that killed a man for ſtealing a muſket. The neareſt imitation they could reach of king George, was by calling him *Kihiargo*. We have the following obſervations on this ſubject, in vol. ii. of Cook's laſt voyage to the Pacific Ocean: "The language of Otaheitee, though doubtleſs radically the ſame with that of New Zealand and the Friendly Iſlands, is deſtitute of that guttural pronunciation, and of ſome conſonants, with which thoſe latter dialects abound. The ſpecimens we have already given are ſufficient to mark wherein the variation chiefly conſiſts, and to ſhow, that, like the manners of the inhabitants, it has become ſoft and ſoothing. During the former voyage, I had collected a copious vocabulary, which enabled me the better to compare this dialect with that of the other iſlands; and during this voyage I took every opportunity of improving my acquaintance with it, by converſing with Omai before we arrived, and by my daily intercourſe with the natives while we now remained there (A). It abounds

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(A) See this vocabulary at the end of the ſecond volume of Captain Cook's ſecond voyage. Many corrections and additions to it were now made by this indefatigable inquirer; but the ſpecimens of the language of Otaheitee, already in the hands of the public, ſeem ſufficient for every uſeful purpoſe.

Otaheitee. abounds with beautiful and ſigurative expreſſions, which, were it perfectly known, would, I have doubt, put it upon a level with many of the languages that are moſt in eſteem for their warm and bold images. For inſtance, the Otaheiteans expreſs their notions of death very emphatically, by ſaying, "that the ſoul goes into darkneſs; or rather into night And, if you ſeem to entertain any doubt, in aſking the queſtion, "if ſuch a perſon is their mother?" they immediately reply with ſurpriſe, "Yes, the mother that bore me." They have one expreſſion that correſponds exactly with the phraſeology of the ſcriptures, where we read of the yearning of the bowels."—They uſe it on all occaſions, when the paſſions give them uneaſineſs, as they conſtantly refer pain from grief, anxious deſire, and other affections, to the bowels, as its ſeat; where they likewiſe ſuppoſe all operations of the mind are performed Their language admits of that inverted arrangement of words which ſo much diſtinguiſhes the Latin and Greek from moſt of our modern European tongues, whoſe imperfections require a more orderly conſtruction, to prevent ambiguities. It is ſo copious, that for the bread fruit alone, in its different ſtates, they have above 20 names; as many for the taro root; and about 10 for the cocoa-nut. Add to this, that, beſides the common dialect, they often expoſtulate in a kind of ſtanza or recitative, which is anſwered in the ſame manner."

A map of Otaheitee, engraved for Captain Cook's firſt voyage, was taken out, and laid before Tuahow the high admiral, without informing him of what it was; however, he immediately found it out, and was overjoyed to ſee a repreſentation of his own country. He pointed out all the diſtricts of it, naming every one of them in their order.

Theſe people have a remarkable ſagacity in foretelling the weather, particularly the quarter from whence the wind will blow. In their long voyages they ſteer by the ſun in the day, and in the night by the ſtars; all of which they diſtinguiſh by ſeparate names, and know in what part of the heaven they will appear in any of the months during which they are viſible in their horizon. They alſo know the times of their annual appearing and diſappearing, with more preciſion than would eaſily be believed by an European aſtronomer. Their time they ſeem to reckon by moons, 13 of which make a year. The day they divide into ſix parts, and the night into an equal number. They judge of the time of the day by the height of the ſun, but they cannot aſcertain the time of the night by the ſtars. In numeration, the greateſt length they can go is 200; that is, when they have counted each of their fingers and toes ten times over. When they take the diſtance from one place to another, they expreſs it by the time which is required to paſs it.

16 Government. The government of the Otaheiteans ſeems greatly to reſemble the early ſtate of the European nations under the feudal ſyſtem. Their orders of dignity are *earee-rahie*, which anſwers to king; *earee*, baron; *manahouni*, vaſſal; and *towtow*, villein. There are two kings in the iſland, one being the ſovereign of each of the peninſulas of which it conſiſts. Each of them is treated with great reſpect by all ranks, but does not appear to be inveſted with ſo much power as is exerciſed by the earees in their own diſtricts. When the king, whom they called *O-Too*, made a viſit to Captain Cook, the chiefs, who happened to be there before him, immediately ſtripped themſelves in great haſte. Captain Cook took notice of it; upon which they ſaid *earee*, *earee*, ſignifying, that it was on account of O-Too being preſent; but this was the only outward token of reſpect they paid him, for they never roſe from their [illegible], or made any other obeiſance.

The *earees* are lords of one or more of the diſtricts into which each of the peninſulas is divided, and of which there are 43 in the larger one. Theſe parcel out their territories to the *manahounis*, who ſuperintend the cultivation of the ground. The loweſt claſs, called *towtows*, ſeem to be nearly under the ſame circumſtances with the villeins in feudal governments. They do all the laborious work, cultivate the land, catch fiſh, fetch wood and water, &c. Each of the earees keeps a kind of court, and has a great number of attendants, chiefly the younger brothers of their own tribe; and among theſe ſome hold particular offices, but of which little more is known than ſome of their names.

In this country a child ſucceeds to his father's titles and authority as ſoon as he is born: and thus the king no ſooner has a ſon born, than his ſovereignty ceaſes. A regent is then choſen; and the father generally retains his power under that title, until his child becomes of age. The child of the baron ſucceeds to the titles and honours of its father as ſoon as it is born, as well as the ſon of the king; ſo that a baron who was yeſterday called *earee*, and was approached with the ceremony of lowering their garments, ſo as to uncover the upper part of the body, is to-day, if his wife happens to be delivered of a child, reduced to the rank of a private man; all marks of reſpect being transferred to the child, if it is ſuffered to live, though the father ſtill continues poſſeſſor and adminiſtrator of his eſtate. But the acquieſcence which the lower claſs of people, or *towtows*, yield to the command of their chiefs, is very remarkable. They are not ſuffered to taſte any animal food, although they are employed in feeding it for their lords. They endure patiently very ſevere blows, if, when collected into a large body, they in any manner preſs upon or annoy the king or a chief in his progreſs; and all this paſſive ſpirit is preſerved without any power being lodged in the hands of the king to exact it; for he uſes no military force, nor is even attended with body guards.

There are but few actions which are reckoned crimes among the Otaheiteans. Adultery, however, is ſometimes puniſhed with death: but in general, the woman eſcapes with a ſevere beating, and the gallant paſſes unnoticed. The regulation of public juſtice is not confined to the magiſtrate; for the injured party redreſſes his own wrong by inflicting whatever puniſhment he can upon the offender: but in matters of notorious wrong the chiefs ſometimes interpoſe. The nobility have livery for their ſervants; and in proportion as the maſter's rank is more or leſs elevated, theſe ſaſhes are worn higher or lower, being faſtened cloſe under the arms of the ſervants belonging to the chiefs, and going round the loins of thoſe belonging to the loweſt claſs of nobility. Several parts of the iſland ſeem to be private property, which deſcend to the heir of the poſſeſſor on his death, and the deſcent ſeems to fall indifferently on man or woman. Captain Cook was of opinion that the number of inhabitants on the whole iſland amounted to 204,000, including women and children.

The religious language of the Otaheiteans, like that of the Gentoo Bramins, is different from what is uſed in common diſcourſe; but, according to the accounts we have of their notions concerning the origin of the

17 Religion. world, nothing can be more ridiculous. They imagine that the Supreme Deity, beſides a great many female deſcendants, has one ſon named *Tane;* and to him they direct their worſhip, though they do not believe that the good or bad conduct of mankind here on earth makes them more or leſs acceptable to this divinity. They believe the exiſtence of the ſoul after death, and of a greater or leſſer degree of happineſs to be then enjoyed: but they ſeem to have no conception of a ſtate of puniſhment or of ſuffering hereafter. The ſhare of happineſs which they imagine every individual will enjoy in this future ſtate, will be aſſigned to him according to the rank he holds on earth. We are not, however, told wherein they ſuppoſe the happineſs of this future ſtate to conſiſt; but it is moſt probably a pretty exact imitation of a Mohammedan paradiſe, for theſe voluptuaries can hardly be ſuppoſed capable of imagining any pleaſure independant of the intercourſe of the ſexes.

The prieſthood ſeems to be hereditary in one family or tribe; and as it is ſaid to be numerous, probably thoſe of that order are reſtrained from becoming members of the Arreoy: but whether or not any peculiar decorum is neceſſary to be obſerved, hath not yet appeared. Theſe prieſts are profeſſedly the men of ſcience; but their knowledge is altogether frivolous and uſeleſs, for it conſiſts in being converſant with the names of their different divinities, and ſuch abſurd traditions as have been handed down among them from one generation to another. Their religious notions being depoſited in an unknown tongue, they are reſpected becauſe they are not underſtood; and as the cure of the ſoul is no object of regard, the moſt important concern to theſe people, the cure of their bodies, is committed to the prieſts, and much parade is uſed in their attempts to recover the ſick, though their remedies conſiſt of ridiculous ceremonies and enchantments rather than any thing elſe.

The marriages of theſe people are merely ſecular contracts; but no one has a right to perform the operation of tattowing except the prieſts; and this being a cuſtom univerſally adopted by the natives, it may be ſuppoſed that performing it is a very lucrative employment. The males in general undergo a kind of circumciſion, which it is diſgraceful not to comply with, and which is likewiſe the excluſive privilege of the prieſts to perform. But what moſt eſtabliſhes the credit of this order of men is their ſkill in aſtronomy and navigation.

Captain Cook, who had ſome reaſon to believe that, among the religious cuſtoms of this people, human ſacrifices were ſometimes offered up to their deities, went to a morai, or place of worſhip, accompanied by Captain Furneaux, having with them a ſailor who ſpoke the language tolerably well, and ſeveral of the natives. In the morai was a tupapow, a kind of bier, with a ſhed erected over it, on which lay a corpſe and ſome proviſions. Captain Cook then aſked if the plantain were for the Eatua? If they ſacrificed to the Eatua hogs, dogs, fowls, &c.? To all of which an intelligent native anſwered in the affirmative. He then aſked if they ſacrificed men to the Eatua? He was anſwered, *tauto eno*, "bad men they did; firſt *tiparrahy*, beating them till they were dead." He then aſked if good men were put to death in this manner? His anſwer was no, only *tauto eno*. The Captain then aſked if any Earees were? The native replied, they had hogs to give the Eatua, and again repeated *tauto eno*. He was then aſked if towtows, who had no hogs, dogs, or fowls, but yet were good men, were ever ſacrificed to the Eatua? The anſwer ſtill was no, only bad men. Many other queſtions were put to him; all his anſwers to which ſeemed to confirm the ideas that men for certain crimes were condemned to be ſacrificed to the gods, provided they did not poſſeſs any property which they might give for their redemption. However, in purſuing ſuch inquiries as theſe, no certain information could be obtained, on account of the ſlight knowledge which had been acquired of the language of the country: but according to further accounts which Captain Cook received from Omai, it ſeems to reſt with the high-prieſt to ſingle out the victims for ſacrifice; who, when the people are aſſembled on any ſolemn occaſion, retires alone into the houſe of God, and ſtays there for ſome time; when he comes out, he informs the aſſembly that he has ſeen and converſed with the great god (the high prieſt alone having that privilege), and that he has aſked for a human ſacrifice; and tells them he has deſired ſuch a perſon, naming a man preſent, who has moſt probably, on ſome account or other, rendered himſelf obnoxious to this ghoſtly father. The words are no ſooner gone out of his mouth, than the devoted wretch is put to death; for his guilt cannot be doubted, after the oracle has pronounced his doom.

On this iſland was ſeen the figure of a man conſtructed of baſket work, rudely made, but not ill deſigned: it was ſomething more than ſeven feet high, and rather too bulky in proportion to its height. This wicker ſkeleton was completely covered with feathers, which were white where the ſkin was to appear, and black in the parts which it is their cuſtom to paint or ſtain, as well as upon the head, which was deſigned to repreſent hair. Upon the head alſo were four protuberances, three in front, and one behind, which the Indians called *tate eté*, little men. The image was called *Monioe;* it was a repreſentation of *Mauwe*, one of their Eatuas, or gods of the ſecond claſs, and was ſaid to be the only one of the kind on Otaheitee.

Theſe people pray at ſun riſe and ſun-ſet. They have alſo a number of ſuperſtitious practices, in order to conciliate the influence of evil genii. E-Tee, a chief, who ſeemed to be the king's prime miniſter in 1774, very ſeriouſly aſked Mr Forſter whether they had a god *(Eatua)* in their country, and whether they prayed to him *(epore?)* When he told them that they acknowledged a divinity who had made every thing, and was inviſible, and that they were accuſtomed to addreſs their petitions to him, he ſeemed to be highly pleaſed, and repeated his words with comments of his own, to ſeveral perſons who ſat round him; ſeeming thereby to intimate, that the ideas of his countrymen correſponded with theirs in this reſpect.

Their mŏrais are uſed both as burying-grounds and places of worſhip; they are approached with the moſt wonderful expreſſions of reverence and humility; and this, it ſhould ſeem, not becauſe any thing there is eſteemed ſacred, but becauſe they there worſhip an inviſible being, for whom they entertain the moſt reverential reſpect, although not excited by the hope of reward or the dread of puniſhment. Though they do not appear to have any viſible object of worſhip, yet, ſays Captain Cook, this iſland, and indeed the reſt that lie near it, have a particular bird, ſome a heron, and others a kingsfiſher, to which they pay a particular regard, and concerning which they have ſome ſuperſtitious notions, reſpecting good or bad fortune, as we have of the ſwallow and robin redbreaſt, and will on no account moleſt or kill them. One of theſe cemeteries, or places of worſhip, was known to Captain Cook, on his firſt voyage, by the name of Tootahah's morai, then the regent; but when, on his ſecond voyage, after the death of that chief, he called it by that name, Maratata, a chief that accompanied the party, interrupted him, intimating, that it was no longer Tootahah's after his death, but was then known as O-Too's morai, the then reigning prince. A fine moral for princes! daily reminding them of mortality whilſt they live, and teaching them, that after death they cannot call even that ground their own which their dead corpſe occupies! The chief and his wife, on paſſing by it, took their upper garments from their ſhoulders. From hence it ſhould ſeem, that the royal family have a particular morai, and that it always bears the name of the reigning prince.

13
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An Indian, who had ſnatched away a muſket from a ſentry whilſt on duty, was, by the inhumanity of a midſhipman who commanded the guard, purſued and ſhot. The unhappy fate of this poor fellow gave an opportunity for ſeeing the manner in which theſe people treat their dead. They placed the corpſe in the open air till the bones became quite dry: a ſhed was erected cloſe by the houſe where the deceaſed had reſided; it was about 15 feet long, and eleven broad; one end was left quite open; the other end, and the two ſides, were partly incloſed with a ſort of wicker-work. The bier was a frame of wood, like that on which the ſea-beds, called *cots*, are placed, with a matted bottom, and ſupported by four poſts, at the height of about four feet from the ground. The body was covered firſt with a mat, and then with white cloth; by the ſide of it lay a wooden mace, one of their weapons of war; and near the head of it, which lay next to the cloſe end of the ſhed, lay two cocoa nut ſhells; at the other end a bunch of green leaves, with ſome dried twigs, all tied together, were ſtuck in the ground, by which lay a ſtone about as big as a cocoa-nut. Near theſe lay one of the young plantain-leaves that are uſed for emblems of peace, and cloſe by it a ſtone axe. At the open end of the ſhed alſo hung, in ſeveral ſtrings, a great number of palm-nuts; and without the ſhed was ſtuck up in the ground a ſtem of a plantain tree, about ſix feet high, upon the top of which was placed a cocoa-nut ſhell full of freſh water; againſt the ſide of one of the poſts hung a ſmall bag, containing a few pieces of bread-fruit ready roaſted, which had not been put in all at one time, ſome being freſh and others ſtale. This minute examination of their manner of treating their dead, ſeemed to be very unwelcome to the natives. The food ſo placed by the corpſe is deſigned as an offering to their gods. They caſt in, near the body, ſmall pieces of cloth, on which the tears and blood of the mourners have been ſhed; for in their paroxyſms of grief it is an univerſal cuſtom to wound themſelves with a ſhark's tooth. The mourner is always a man; and he is dreſſed in a very ſingular habit. When the bones are ſtripped of their fleſh, and become dry, they are buried. This regard to their dead is very remarkable: one of the ſhip's company happening to pull a flower from a tree which grew on one of their ſepulchral incloſures, an Indian came ſuddenly behind him and ſtruck him; and a party of ſailors, who were ſent to get ſome ſtones for ballaſt for the ſhip, had like to have been embroiled by the natives, by pulling down ſome part of an incloſure of this kind. This ſhade under which their dead are laid is called *tupapow*; the incloſure in which their bones are depoſited is called *morai*; theſe latter, as has been already related, are alſo places of worſhip. As ſoon as a native of Otaheitee is known to be dead, the houſe is filled with relations, who deplore their loſs; ſome by loud lamentations, and ſome by leſs clamorous, but more genuine expreſſions of grief. Thoſe who are in the neareſt degree of kindred, and are really affected by the event, are ſilent; the reſt are one moment uttering paſſionate exclamations in a chorus, and the next laughing and talking without the leaſt appearance of concern. In this manner the remainder of the day on which they aſſemble is ſpent, and all the ſucceeding night. On the next morning the body is ſhrouded in their cloth, and conveyed to the ſea-ſide on a bier, which the bearers ſupport upon their ſhoulders, attended by the prieſt, who having prayed over the body repeats his ſentences during the proceſſion. When it arrives at the water's edge, it is ſet down upon the beach; the prieſt renews his prayers, and taking up ſome of the water in his hands, ſprinkles it towards the body, but not upon it. It is then carried back 40 or 50 yards; and ſoon after brought again to the beach, where the prayers and ſprinkling are repeated. It is thus removed backwards and forwards ſeveral times; and while theſe ceremonies have been performing, a houſe has been built, and a ſmall ſpace of ground railed in. In the centre of this houſe, or *tupcpow*, as they term it, poſts are ſet up to ſupport the bier, which is at length conveyed thither, and placed upon it; and here the body remains to putrify, till the fleſh is wholly waſted from the bones. Theſe houſes of corruption are of a ſize proportioned to the rank of the perſon whoſe body they are to contain. Thoſe allotted to the lower claſs are juſt ſufficient to cover the bier, and have no railing round them. The largeſt that was ſeen was 11 yards long; and ſuch are ornamented according to the abilities and inclination of the ſurviving kindred, who never fail to lay a profuſion of good cloth about the body, and ſometimes almoſt cover the outſide of the houſe. Garlands of the fruit of the palm-nut, or pandanus, and cocoa-leaves, twiſted by the prieſts in myſterious knots, with a plant called by them *ethee no morai*, which is particularly conſecrated to funeral ſolemnities, are depoſited about the place; proviſion and water are alſo left at a little diſtance. As ſoon as the body is depoſited in the tupapow, the mourning is renewed. The women aſſemble, and are led to the door by the neareſt relation, who ſtrikes a ſhark's tooth ſeveral times into the crown of her head; the blood copiouſly follows, and is carefully received upon pieces of linen, which are thrown under the bier. The reſt of the women follow this example; and the ceremony is repeated at the interval of two or three days, as long as the zeal and ſorrow of the parties hold out. The tears alſo which are ſhed upon theſe occaſions are received upon pieces of cloth, and offered as oblations to the dead. Some of the younger people cut off their hair, and that is thrown under the bier with the other offerings. This cuſtom is founded on a notion, that the ſoul of the deceaſed, which they believe to exiſt in a ſeparate ſtate, is hovering about the place where the body is depoſited; that it obſerves the actions of the ſurvivors, and is gratified by ſuch teſtimonies of their affectionate grief. Whilſt theſe ceremonies are carrying on by the women, the men ſeem to be wholly inſenſible of their loſs; but two or three days after, they alſo begin to perform a part. The neareſt relations take it in turn to aſſume the dreſs, and perform the offices.

The chief mourner carries in his hand a long flat ſtick, the edge of which is ſet with ſhark's teeth; and in a frenzy, which his grief is ſuppoſed to have inſpired, he runs at all he ſees, and if any of them happen to be overtaken, he ſtrikes them moſt unmercifully with his indented cudgel, which cannot fail to wound them in a dangerous manner. The proceſſions continue at certain intervals for five moons; but are leſs and leſs frequent, by a gradual diminution, as the end of that time approaches. When it is expired, what remains of the body is taken down from the bier; and the bones, having been ſcraped and waſhed very clean, are buried, according to the rank of the perſon, either within or without a morai. If the deceaſed was an earee, or chief, his ſkull is not buried with the reſt of his bones, but is wrapped up in fine cloth, and put in a kind of box made for that purpoſe, which is alſo placed in the morai. This coffin is called *ewharre no te oremetua*, "the houſe of a teacher, or maſter." After this the mourning ceaſes, except ſome of the women continue to be really afflicted at the loſs, and in that caſe they will ſuddenly wound themſelves with the ſhark's tooth wherever they happen to be. The ceremonies, however, do not ceaſe with the mourning; for prayers are ſtill ſaid by the prieſt, and offerings made at the morai. Some of the things, which from time to time are depoſited there, are emblematical: a young plantain is ſaid to repreſent the deceaſed, and a bunch of feathers the Deity who is invoked. The prieſt places himſelf overagainſt the ſymbol of the god, accompanied by ſome of the relations, who are furniſhed with a ſmall offering: he repeats his oriſon in a ſet form, conſiſting of ſeparate ſentences; at the ſame time weaving the leaves of the cocoa-nut into different forms, which he afterwards depoſits upon the ground where the bones have been interred: the Deity is then addreſſed by a ſhrill ſcreech, which is uſed only upon that occaſion. When the prieſt retires, the tuft of feathers is removed, and the proviſions are left to putrify, or be devoured by the rats.

This ceremony of mourning, as deſcribed above, was performed by Tirope, one of the wives of Tubourai Tamaide; who, when the bleeding from the wounds which ſhe had thus given herſelf ceaſed, looked up with a ſmile on the company round her, and who had before inquired of her, very earneſtly, the cauſe of her behaviour, without receiving any anſwer, or having been at all noticed by her. She then began to pick up ſome ſmall pieces of cloth which ſhe had ſpread to catch the blood; and having got them all together, ſhe went to the ſhore, and threw them into the ſea. She then plunged into the river; and having waſhed her whole body, returned to the company as cheerful as ever. To add to the ſingularity of this conduct, the Indians who ſtood round her all the time that this frantic diſtreſs was performing, converſed with great indifference and jocularity.

There is not a more ancient cuſtom handed down to us than that of cutting the body to expreſs grief and diſtreſs of mind. In the code of laws delivered by Moſes to the Iſraelites, 1400 years before the Chriſtian era, this practice is expreſsly forbidden to that people: "Ye ſhall not cut yourſelves, or make any baldneſs between the eyes for the dead," Deut. xiv. 1. Hence it may be ſuppoſed that this rite prevailed in Egypt, from whence the Jews derived moſt of thoſe propenſities which were inhibited by their great legiſlator. We are told likewiſe in the book of Kings, of the prieſts of Baal wounding themſelves, after they had long waited in vain for the ſupernatural intervention of their idol. D'Arvieux informs us, that the modern Arabs retain the ſame cuſtom, and that the part they chiefly wound is their arms. The difference in the practice as now prevailing in Otaheitee and Arabia ſeems to be, that in the firſt none but the women make uſe of it, and in the latter it is confined to the men, and generally uſed to expreſs their deſperate paſſion for ſome favourite miſtreſs.

The mourning which is worn here is an head dreſs of feathers, the colour of which is conſecrated to death, and a veil over the face. This dreſs is called *eeva*. The whole nation is ſaid to appear thus on the death of their king. The mourning for fathers is very long. The women mourn for their huſbands, but not the huſbands for their wives.

We ſhall conclude this account of Otaheitee with the hiſtory of *Omai*, or, as he is improperly called *Omiah*, who was brought over to England. He was a native of Ulietea, or Raietea; and embarked at Huahine with Captain Furneaux, on board the Adventure, in September 1773; and the two ſhips ſeparating in a ſtorm on the coaſt of New Zealand a few months afterwards, the voyage of the Adventure was brought to a much earlier concluſion than that of the Reſolution, for ſhe arrived at Spithead the 14th of July following. This youth is ſaid to have had ſome property in his native ſoil, of which he was diſpoſſeſſed by the people of Bolabola: but he was not one of the earees, or gentry of that country, but of the middling claſs of people. He was eminent neither for figure, ſhape, nor complexion; his colour being of a deep hue, reſembling a towtow, or one of the common people;

people; and both Captain Cook and Mr Forſter agree in thinking him no proper ſample of the inhabitants of thoſe iſlands, in reſpect of perſonal beauty. However, they are both of opinion, that the qualities of his heart and head reſembled thoſe of his countrymen in general, and that no one of the natives would have given more general ſatiſfaction by his behaviour whilſt he remained in England. He is deſcribed as poſſeſſing a good underſtanding, quick parts, and honeſt principles: not an extraordinary genius like Tupia; yet not at all deficient in intelligence, which appears from his knowledge of the game of cheſs, in which he made an amazing proficiency. His principal patrons, whilſt in England, were, the Earl of Sandwich, Mr Banks, and Doctor Solander. His noble patron introduced him to his Majeſty at Kew; and, during his ſtay in England, he was careſſed by many of the principal nobility. He naturally imitated that eaſy and elegant politeneſs which is prevalent among the great, and which is one of the ornaments of civilized ſociety. Indeed he adopted the manners, the occupations, and amuſements of his companions in general, and gave many proofs of a quick perception and a lively fancy. He appears, however, to have been treated, whilſt he reſided here, rather as a faſhionable exhibition, than as a rational being. No attention ſeems to have been paid to the enriching his mind with uſeful knowledge, ſuch as might have rendered him a valuable acquiſition to his country on his return thither; no means were uſed to inſtruct him in agriculture, or any mechanical art or uſeful manufacture; and, above all, to poſſeſs him with a moral ſenſe; to teach him the exalted ideas of virtue, and the ſublime principles of revealed religion. After a ſtay of two years in England, and having been inoculated for the ſmall-pox, he embarked with Captain Cook, on board the Reſolution, on his return home, loaded with a profuſion of preſents. At parting with his friends here, his tears flowed plentifully, and his whole behaviour beſpoke him to be ſincerely affected at the ſeparation: but though he lived in the midſt of amuſements during his reſidence in England, his return to his native country was always in his thoughts; and though he was not impatient to go, he expreſſed a ſatiſfaction as the time of his return approached.

Such is the account of this people which our limits permit us to give. In the hiſtory of mankind it is not without importance; and in the hands of the philoſopher, the moraliſt, or the divine, it may be uſeful. The ſubject, becauſe but new, has been much agitated, and is pretty generally known. Such of our readers as make men and manners their peculiar ſtudy, will be anxious for further information; we muſt refer them, however, to thoſe authors who have written particularly and copiouſly on the ſubject. Cook and other voyagers of eminence will at leaſt command attention. We may juſt remark, that there muſt ſurely be ſomething extremely faſcinating in the perſons, manners, or cuſtoms of the inhabitants, or in the ſoil and appearance of the country, that could tempt the greater part of a ſhip's crew to reſiſt authority, and forcibly to return to Otaheitee; yet ſuch we know was the caſe: and the ſufferings of the commander, and thoſe who refuſed to join in this vile conſpiracy, and who were therefore expoſed in an open boat, were indeed ſhocking. An account of it has been lately publiſhed.

OTALGIA, the EAR-ACH, in medicine. See there n° 80. and 364.

OTELANDS, or OATLANDS, in England, in the county of Surry, near Weybridge, was formerly a royal palace, wherein Henry duke of Glouceſter, third ſon to King Charles I. was born; and had a deer-park, which in the late civil wars was by the parliamentarians laid open, and the houſe demoliſhed. In 1673 there was a brick-wall remaining, which encompaſſed ten acres; but there were then ſmall traces of the chief pile, beſides the gardener's lodge, wherein was the ſilk-worm room raiſed by King James I.'s queen. It is now a moſt magnificent building, and commands a moſt extenſive proſpect, which words cannot deſcribe. In the park there was a paddock, where Queen Elizabeth uſed to ſhoot with a croſs bow. It is now the property of his royal highneſs the Duke of York, who purchaſed it for 43,000 l. of the Duke of Newcaſtle, 1789.

OTFORD, in England, in the county of Kent, by the Darent, at the bottom of a hill. In 793 there was a battle at this place, between the two Saxon kings, Offa of Mercia and Alrick of Kent, who was killed by Offa; and another in 1016, wherein the Daniſh king Canute was routed by King Edmund Ironſide. The ſaid Offa, to atone for the blood he had ſhed in that battle, firſt gave this place to Chriſt-church, Canterbury (as the deed ſays) *in paſcua porcorum*, "for the ſupport of the archbiſhop's hogs;" and ſo it remained in the archbiſhop's liberty, till exchanged with King Henry VIII. for other lands. There was a chantry founded at the Ryehouſe in this pariſh. The church was once a chapel to Shoreham.

OTHNIEL, in ſacred hiſtory, the ſon of Kenaz, of the tribe of Judah. We are told (Joſh. xv. 17.), that Othniel was brother to Caleb; and (Judges i. 13.) it is expreſsly ſaid, that he was Caleb's younger brother. There are, however, ſome difficulties in this; for if Caleb and Othniel had been brothers, the latter could not have married his niece Achſah the daughter of Caleb. Secondly, the ſcripture never aſſigns to Caleb and Othniel the ſame father: it always names Kenas as father to Othniel, and Jephunneh as the father of Caleb. Laſtly, Caleb muſt be much older than Othniel, ſince he gave Othniel his daughter Achſah in marriage. Thus it ſeems much better to ſuppoſe Kenaz and Jephunneh to be two brothers, and that Othniel and Caleb were couſin-germans, and in this ſenſe to be nearly related, or brothers according to the language of ſcripture. Thus Achſah being but ſecond couſin in reſpect of Othniel, he might marry her without doing any thing contrary to the letter of the law.

Caleb having received his portion in the mountains of Judah, in the midſt of a country that was poſſeſſed by giants of the race of Anak, after he had taken the city of Hebron, he advances towards Debir, otherwiſe called *Kirjath ſepher*, and declares that he would give his daughter Achſah in marriage to him that ſhould take Kirjath-ſepher. Othniel took it, and had Achſah to wife.

After the death of Joſhua, the Iſraelites not giving themſelves the trouble to exterminate the Canaanites that

Otho.

that were then in the land, and not having continued in their fidelity to the Lord, he delivered them over to Chuſhan-ruſhathaim king of Meſopotamia (Judges iii. 4, &c.), to whom they continued in ſubjection for eight years. Then they cried to the Lord, who raiſed them up a deliverer in the perſon of Othniel the ſon of Kenaz, who was filled with the ſpirit of God, and judged Iſrael. He came into the field, and gave battle to Chuſhan-ruſhathaim, beat him, and delivered Iſrael in the year of the world 2599; and the country was at reſt for 40 years. After this Othniel died; but the preciſe year of his death is not known.

OTHO (M. Salvius), a Roman emperor, born A. D. 32, of a family deſcended from the ancient kings of Etruria. He was among the number of Nero's favourites, and accordingly was raiſed to the higheſt offices of the ſtate, and made governor of Pannonia by the intereſt of Seneca, who wiſhed to remove him from Rome, leſt Nero's love for Poppæa ſhould prove his ruin. After Nero's death Otho conciliated the favour of Galba the new emperor; but when he did not gain his point, and when Galba refuſed to adopt him as his ſucceſſor, he reſolved to make himſelf abſolute, without any regard to the age or dignity of his friend. The great debts which he had contracted encouraged his avarice; and he procured the aſſaſſination of Galba, and made himſelf emperor. He was acknowledged by the Senate and the Roman people; but the ſudden revolt of Vitellius in Germany rendered his ſituation very precarious, and it was mutually reſolved that their reſpective right to the empire ſhould be decided by arms. Otho obtained three victories, but in a general engagement near Brixellum his forces were defeated, and he ſtabbed himſelf when all hopes of ſucceſs had vaniſhed. This happened about the 37th year of his age, after a reign of about three months. It has been juſtly obſerved, that the laſt moments of Otho's life were thoſe of a philoſopher. He comforted his ſoldiers who lamented his fortune, and he expreſſed his concern for their ſafety when they earneſtly ſolicited to pay him the laſt friendly offices before he ſtabbed himſelf; and he obſerved, that it was better that one man ſhould die than that all ſhould be involved in ruin on account of his obſtinacy. His nephew was much affected and feared exceedingly the anger and haughtineſs of the conqueror; but Otho comforted him, and obſerved, that Vitellius would be kind and affectionate to the friends and relations of Otho, ſince Otho was not aſhamed to ſay, that in the time of their greateſt enmity the mother of Vitellius had received every friendly treatment from his hands. He alſo burnt the letters which, by falling into the hands of Vitellius, might provoke his reſentment againſt thoſe who had favoured the cauſe of an unfortunate general. Theſe noble and humane ſentiments in a man who was the aſſociate of Nero's ſhameful pleaſures, and who had ſtained his hand in the blood of his maſter, have appeared to ſome wonderful, and have paſſed for the features of policy, and not of a naturally virtuous and benevolent heart. His father was a favourite of Claudius.

Otho, a tribune of the people, who, in Cicero's conſulſhip, made a regulation to permit the Roman knights at public ſpectacles to have the 14 firſt rows after the ſeats of the ſenators. This was oppoſed with virulence by ſome, but Cicero ably defended it, &c.

Otho
||
Othryades.

Otho (Venius), a very celebrated Dutch painter. He was deſcended of a conſiderable family in Leyden, and was born in 1556. He was carefully educated by his parents in the belles lettres, and at the ſame time learned to deſign of Iſaac Nicholas. He was but 15 when the civil wars obliged him to leave his country. He retired to Liege, finiſhed his ſtudies, and there gave the firſt proofs of the excellence of his mind. He was well known to Cardinal Grooſbeek, who gave him letters of recommendation when he went to Rome, where he was entertained by Cardinal Maduccio. His genius was ſo active, that he applied himſelf to philoſophy, poetry, mathematics, and painting, all at once. He became a great proficient in deſigning under Frederico Zuchero. He acquired an excellence in all the parts of painting, eſpecially in the knowledge of the claro-obſcuro; by which means he came to be accounted one of the moſt ingenious men of his age. He lived at Rome ſeven years, during which time he performed ſeveral rare pieces; and then paſſing into Germany, was received into the ſervice of the emperor. After this the duke of Bavaria and the elector of Cologne employed him; but all the advantages he got from the courts of foreign princes could not detain him there. He had a deſire to return into the Low Countries, of which Alexander Farneſe, prince of Parma, was then governor. He drew the prince's picture, armed cap-a-pee, which confirmed his reputation in the Netherlands. After the death of that prince, Venius returned to Antwerp, where he adorned the principal churches with his paintings. The archduke Albert, who ſucceeded the prince of Parma in the government of the Low Countries, ſent for him to Bruſſels, and made him maſter of the mint; a place which occupied much of his time, yet he found ſome time for the exerciſe of his profeſſion. He drew the archduke and the infanta Iſabella's portraits at large, which were ſent to James I. of Great Britain: and, to ſhow his knowledge of polite learning likewiſe, he publiſhed ſeveral treatiſes, which he embelliſhed with cuts of his own deſigning. Louis III. made him very great offers to tempt him into his ſervice; but he would never leave his own country, ſatisfying himſelf with the character and employments he held there. He was the firſt, after Polydore Caravaggio, who reduced the claro-obſcuro to a principle of the art of painting. Rubens perfected what he began, and the whole Flemiſh ſchool learned it off him. Venius died at Bruſſels, 1634, in his 78th year. He had two brothers, Gilbert, who was a graver, and Peter a painter. He had alſo the honour of breeding up the famous Rubens in his art.

OTHONNA, in botany: A genus of the polygamia neceſſaria order, belonging to the *ſyngeneſia* claſs of plants; and in the natural method ranking under the 49th order, *Compoſitæ*. The receptacle is naked; there is almoſt no papus; the calyx is monophyllous, multifid, and nearly cylindrical.

OTHRYADES, one of the 300 Spartans who fought againſt 300 Argives, when thoſe two nations diſputed their reſpective right to Thyreata. Two Argives, Alcinor and Cronius, and Othryades, ſurvived the battle. The Argives went home to carry the news of their victory ; but Othryades, who had been reckoned among the number of the ſlain on account of his wounds, recovered himſelf, and carried ſome of the ſpoils of which he had ſtripped the Argives into the camp of his countrymen; and after he had raiſed a trophy, and had written with his own blood the word *vici* on his ſhield, he killed himſelf, unable or unwilling to ſurvive the death of his countrymen.

OTIS, in ornithology, a genus of birds belonging to the order of grallæ. There are four ſpecies, principally diſtinguiſhed by their colour. One of the ſpecies, the tarda, or buſtard, is the largeſt of the Britiſh land-fowl; the male at a medium weighing 25 pounds; there are inſtances of ſome very old ones weighing 27: The breadth nine feet; the length near four. Beſides the ſize and difference of colour, the male is diſtinguiſhed from the female by a tuft of feathers about five inches long on each ſide of the lower mandible. Its head and neck are aſh-coloured: the back is barred tranſverſely with black and bright ruſt colour: the greater quill-feathers are black: the belly white: the tail is marked with broad red and black bars, and conſiſts of twenty feathers: the legs duſky.

The female is about half the ſize of the male: the crown of the head is of a deep orange, traverſed with black lines; the reſt of the head is brown. The lower part of the fore-ſide of the neck is aſh coloured: in other reſpects it reſembles the male, only the colours of the back and wings are far more dull.

Theſe birds inhabit moſt of the open countries of the ſouth and eaſt parts of this iſland, from Dorſetſhire, as far as the Wolds in Yorkſhire. They are exceeding ſhy, and difficult to be ſhot; run very faſt, and when on the wing can fly, though ſlowly, many miles without reſting. It is ſaid that they take flight with difficulty, and are ſometimes run down with greyhounds. They keep near their old haunts, ſeldom wandering above 20 or 30 miles. Their food is corn and other vegetables, and thoſe large earth-worms that appear in great quantities on the downs before ſunriſing in the ſummer. Theſe are replete with moiſture, anſwer the purpoſe of liquids, and enable them to live long without drinking on thoſe extenſive and dry tracts. Beſides this, nature hath given the males an admirable magazine for their ſecurity againſt drought, being a pouch, whoſe entrance lies immediately under the tongue, and which is capable of holding near ſeven quarts; and this they probably fill with water to ſupply the hen when ſitting, or the young before they can fly. Buſtards lay only two eggs, of the ſize of thoſe of a gooſe, of a pale olive-brown, marked with ſpots of a dark colour; the make no neſt, only ſcrape a hole in the ground. In autumn they are (in Wiltſhire) generally found in large turnip-fields near the Downs, and in flocks of 50 or more.

Plate CCCLXIX.

OTLEY, a town of England, in the Weſt Riding of Yorkſhire, under a cliff called *Chevin*, on the ſouth ſide of the river Wherfe. The adjacent parts are reckoned the moſt delightful in England. Its church has lately been elegantly fitted up, in which are ſeveral good old monuments. The adjacent country is much improved, and from the Chevin is a moſt beautiful view of an extenſive ſcope of undeſcribed manſions. This manor was given by Athelſtan to the ſee of York, whoſe archbiſhop had a palace here, with ſeveral extenſive privileges. There is a free grammar-ſchool in this place, founded by Mr Cave, 1611, called *Prince Henry's School.* In 1673, it ſuffered much by an inundation; which carried away ſeveral bridges, mills, &c. as well as much corn, &c.

OTODINI, ancient Britons, ſeated, as ſome ſuppoſe, to the north eaſt of the Brigantes, in the countries now called Northumberland, Merſe, and the Lothians. As the Otodini are not mentioned by any of the Roman hiſtorians, but only by Ptolemy, it is uncertain whether they formed a diſtinct independent ſtate, or were united with the Brigantes. They were, however a conſiderable people, and poſſeſſed a long tract of the ſea-coaſt, from the river Tine to the Frith of Forth. Their name is derived by Baxter from the old Britiſh words *Ot o dineu*, which ſignify "a high and rocky ſhore;" deſcriptive enough of their country. They were probably reduced by Agricola at the ſame time with their more powerful neighbours the Brigantes; but as they lived without the wall of Severus, they were, like the reſt of the Mæatæ, engaged in frequent revolts. In the moſt perfect ſtate of the Roman government in this iſland, the country of the Otodini made a part of the Roman province called Valentia; which comprehended all that large tract between the two walls. As this province was never long together in the peaceable poſſeſſion of the Romans, they had but few ſtations in the country of the Otodini, except thoſe on the line of the wall of Severus.

Henry's Hiſt. Gr. Brit. vol. 1 p. 185, &c.

Various authors have derived the name of this people in various ways, and it is very differently ſpelled; and various opinions ſtill ſeem to be en [illegible] among the learned reſpecting their real ſituation; it is even doubtful whether their country was in England or in Scotland. The celebrated Drummond of Hathornden contends for the latter.

OTRANTO, or TERRA D'OTRANTO, a province of Italy in the kingdom of Naples; bounded on the north by the Terra di Bari and by the gulph of Venice, on the eaſt by the ſame gulph, and on the ſouth and weſt by a great bay which is between that and the Baſilicata. It is a mountainous country, abounding in figs, olives, and wine. It is often viſited by locuſts, and by Algerine pirates, who carry off all the people they can catch into ſlavery. But to keep them off, there are a great many forts on the coaſts.

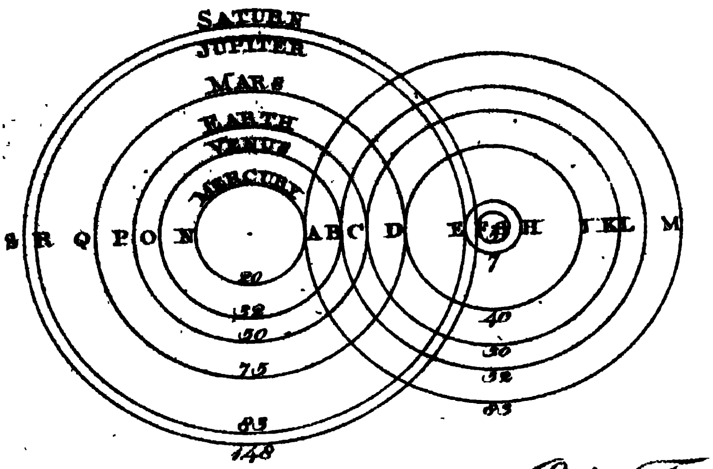
OTRANTO, a city of Italy, in the kingdom of Naples, and capital of the province of the ſame name, with a commodious harbour, an archbiſhop's ſee, and a ſtrong citadel, where the archbiſhop reſides. Mr Swinburne * gives this account of it: "It is (ſays he) ſmall, ſtands on a hill, and contains only 3000 inhabitants. Its little harbour is not ſo bad but it might induce more people to ſettle here, as no port on the coaſt lies ſo convenient for traffic with Greece. The Adriatic gulph is here but 60 miles wide. I climbed to the top of a tower, to get a ſight of the Acroceraunian mountains; but a vapour hanging over the ſea, along the horizon, hid them from my view: in a clear morning, their ſnowy tops are ſaid to be very viſible. The cathedral of Otranto is Gothic, and, according to the Puglian faſhion, has its ſubterraneous ſanctuary. The columns are of beautiful marble and granite;

the

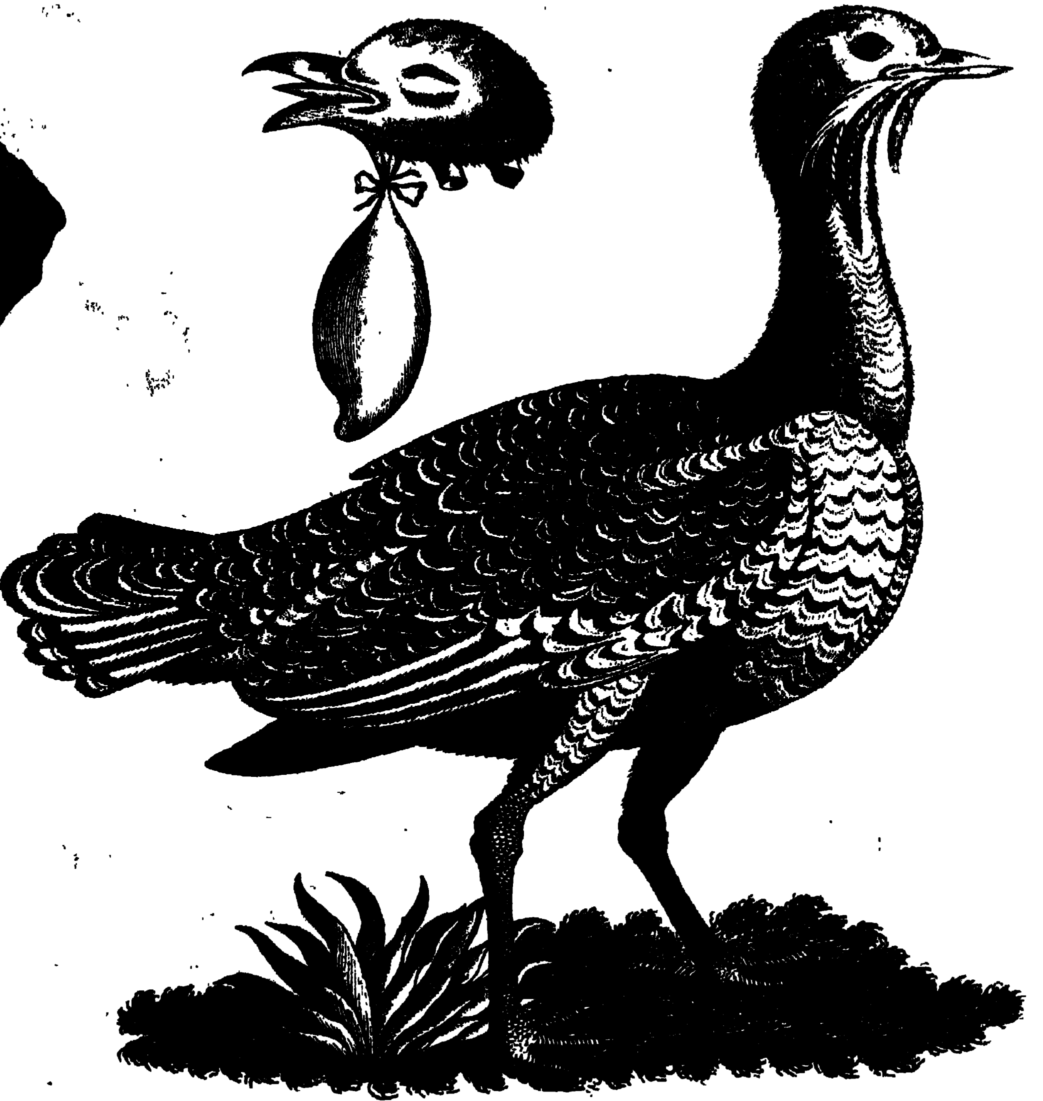
* Travels in the two Sicilies, vol. 1.

ORRERY.

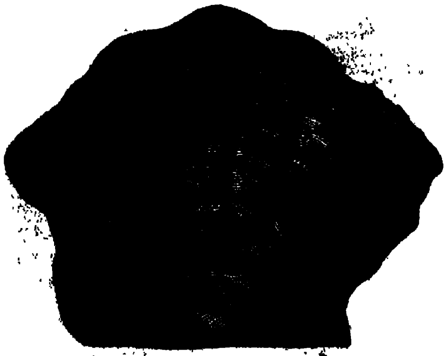
Plate CCCLXIX.



Otis Tarda.



Ostrea Ephippium



Ostrea Edulis

Mitchell Prin. Wal. Sculptor fecit

the pavement a rude ſpecies of moſaic, commonly called *Saracenic*: As it is to be met with in all churches founded by the Norman kings of Sicily, the artiſts who laid it were probably Saracens, or at leaſt Greeks, their ſcholars. Theſe moſaics are compoſed of pieces of porphyry, ſerpentine, and cubes of gilt glaſs,—diſpoſed in ſtars, circles, or chequers. The compartments of the ſtalls are bordered with them; and the ſmall twiſted columns, which ſupport the pulpits and canopies, are ornamented with a ſpiral ſtripe of the ſame work. It is a pity ſo much durability, compactneſs, and beauty of materials, ſhould have been laviſhed on ſuch barbarous deſigns. Otranto was a Roman colony, as is certified by an inſcription, almoſt the only monument of antiquity left there (A). In the 10th century it was made an archbiſhop's ſee. In 1480, Laurence de Medici, to deliver himſelf from the attacks of the king of Naples, perſuaded Mahomet II. to invade the realm; and Otranto was the unfortunate place where the Turks landed. It was inveſted, ſtormed, and pillaged. Its prelate was ſlain at the door of his church; 800 principal citizens dragged out of the gates and butchered; their bodies left 12 months unburied, till the duke of Calabria retook the city, and committed them to hallowed earth. About 100 years after, a devout perſon affirmed, that theſe bones had appeared to him in a dream; and, upon the ſtrength of his viſion, they became, for the vulgar, objects of almoſt equal veneration with the relicks of the primitive martyrs."

OTRICOLI, a ſmall town of Italy, in the eccleſiaſtic ſtate, and in the duchy of Spoleto, in E. Long. 13. 15. N. Lat. 42. 25. ſituated on a riſing ground on the frontiers of the patrimony of St Peter. From this town is ſeen a fine plain, and ſome of the windings of the famous river Tiber. The ruins that are ſcattered here and there at the entrance of the plain, deſcending from Otricoli, are thought to be the remains of the ancient Otricolum; they conſiſt of ſome ſhapeleſs fragments of columns, cornices, and other pieces of marble. In the middle of the great ſtreet of Otricoli, there is a marble pedeſtal, upon which you ſee an inſcription, ſhowing they had erected a ſtatue to Julia Lucilla, who had built public baths at Otricoli at her own expence.

OTTER, in zoology. See MUSTELA.

OTTER of Roſes. See ROSES.

OTTERBURN, in England, in the county of Northumberland, near Elleſdon. It was the field of battle between the Engliſh and Scots in 1388, wherein Henry Percy, called *Hotſpur*, was taken priſoner, and Douglas the Scotch general was killed. On this battle was founded the delightful old ballad of Chevy-chaiſe; the village being ſituated by the river Rhead, on the ſouth ſide of the Cheviot hills. The entrenchments are ſtill viſible; and a number of tumuli ſcattered over the adjacent ground mark to future ages the ſlaughter made there.

OTTERY, ST MARY'S, a market town in Devonſhire, ſituated 159 miles weſt of London, and 10 miles eaſt of Exeter. Its market is on Tueſdays, and it has two fairs. The church is very ancient, and ſomewhat reſembles a cathedral. A very extenſive woollen manufactory was lately eſtabliſhed here by Sir Geo. Yonge and Sir John Duntze, barts. It has no corporation. It derived its name, as ſome ſuppoſe, from the river Otter, and that from the otters formerly found in it. This town was given by king Edward the Confeſſor to the church of St Mary at Roen in Normandy; but was afterwards bought by Grandiſon biſhop of Exeter; who made of it a quarter college in 10 Edward III. and therein placed ſecular prieſts, with other miniſters, to whom he gave the whole manor, pariſh, tythes, fines, ſpiritual profits, &c. which amounted to L. 304 : 2 : 10 yearly.

OTWAY (Thomas), an eminent tragic poet, was the ſon of Mr Humphry Otway, rector of Wolbeding in Suſſex; and was born at Trottin in that county on the 3d of March 1651. He was educated at Oxford; when, leaving the univerſity without a degree, he retired to London, where he commenced player, but with indifferent ſucceſs. However, the ſprightlineſs of his converſation gained him the favour of Charles Fitz-Charles earl of Plymouth, who procured him a cornet's commiſſion in one of the new-raiſed regiments ſent into Flanders; but he returned from thence in very neceſſitous circumſtances, and applied himſelf again to writing for the ſtage. In comedy he has been deemed too licentious; which, however, was no great objection to his pieces in the profligate days of Charles II. But, in tragedy, few Engliſh poets have ever equalled him; and perhaps none ever excelled him in touching the paſſions, particularly the tender paſſion. There is generally ſomething familiar and domeſtic in the fable of his tragedies, and there is amazing energy in his expreſſion.—The heart that doth not melt at the diſtreſſes of his Orphan muſt be hard indeed! But though Otway poſſeſſed in ſo eminent a degree the rare talent of writing to the heart, yet he was not very favourably regarded by ſome of his cotemporary poets, nor was he always ſucceſsful in his dramatic compoſitions. After experiencing many reverſes of fortune in regard to his circumſtances, but generally changing for the worſe, he at laſt died wretchedly in a public houſe on Tower hill; whither it is ſuppoſed, he had retired, in order to avoid the preſſure of his creditors. Some have ſaid, that downright hunger compelling him to fall too eagerly on a piece of bread, of which he had been for ſome time in want, the firſt mouthful choaked him, and inſtantly put a period to his days. Dr Johnſon gives this account of the matter: "He died in a manner which I am unwilling to mention. Having been compelled by his neceſſities to contract debts, and hunted, as is ſuppoſed, by the terriers of the law, he retired to a public-houſe on Tower hill, where he died of want; or, as it is related by one of his biographers, by ſwallowing, after a long faſt, a piece of bread which charity had ſupplied He went out, as is reported, almoſt naked, in the rage of hunger, and finding a gentleman in a neighbouring coffee-houſe, aſked him for a ſhilling. The gentleman gave him a guinea; and Otway

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(A) "Num. Hydr.—ÆR Caput barb. & laureat. ΤΑΡΟΝΤΙΝΩΝ. = Tridens, cum duobus delphinibus."

way going away bought a roll, and was choaked with the firſt mouthful. All this, I hope, is not true; but that indigence, and its concomitants, ſorrow and deſpondency, brought him to the grave, has never been

Johnſon ſpeaks of him in nearly theſe terms: Otway had not much cultivated verſification, nor much repleniſhed his mind with general knowledge. His principal power was in moving the paſſions, to which Dryden in his latter years left an illuſtrious teſtimony. He appears, by ſome of his verſes, to have been a zealous royaliſt; and had what was in thoſe times the common reward of loyalty; he lived and died neglected—His dramatic writings are nine in number; the moſt admired of which are, *The Orphan*, and *Venice Preſerved*. He had alſo made ſome tranſlations, and wrote ſeveral miſcellaneous poems. His whole works are printed in two pocket volumes. He wrote four acts of a play which are loſt.

OVAL, an oblong curvilinear figure, otherwiſe called *ellipſis*. (See ELLIPSIS). However, the proper oval, or egg ſhape, differs conſiderably from that of the ellipſis, being an irregular figure, narrower at one end than at another: whereas the ellipſis or mathematical oval, is equally broad at each end: though it muſt be owned, theſe two are commonly confounded together; even geometricians calling the oval a *falſe ellipſis*.

OVARY, in anatomy, that part of a female animal wherein the ova or eggs are formed or lodged. See ANATOMY, n° 108. p. 740.

OVARIUM, in botany, a name by which botaniſts who are fond of aſſimilating the animal and vegetable kingdoms have diſtinguiſhed the germen or ſeed bud, as containing the rudiments of the future ſeed.

OVATION, in the Roman antiquity, a leſſer triumph, [illegible]ed to commanders for victories won without the effuſion of blood; or for defeating a mean and inconſiderable enemy. The ſhow generally began at the Albanian mountain, whence the general with his retinue made his entry into the city on foot, with many flutes or pipes ſounding in concert as he paſſed along, and wearing a garland or myrtle as a token of peace. The term *ovation*, according to Servius, is derived from *ovis*, a "ſheep;" becauſe on this occaſion the conqueror ſacrificed a ſheep, as in triumph he ſacrificed a bull. The ſenate, knights, and principal plebeians, aſſiſted at the proceſſion; which concluded at the Capitol, where rams were ſacrificed to Jupiter. The firſt ovation was granted to Publius Poſthumius the conſul, for his victory over the Sabines in the 253d year of Rome.

OUDENARDE, a rich and ſtrong town of the Auſtrian Netherlands, in the province of Flanders, in E. Long. 3. 30. N. Lat. 50. 54. fifteen miles ſouth of Ghent, and eighteen from Tournay. It is a large well fortified town, having a very conſiderable fort in the middle of it, ſituated on the river Scheldt, which divides it into two parts. It is almoſt encompaſſed by meadows, only there is a hill which commands it on the ſouth ſide. The buildings are pretty good, and the ſtreets wide and handſome. The market-place is adorned with a beautiful town-houſe, and a fine large fountain. There are ſeveral good churches and monaſteries well worthy of the notice of travellers. The town has a very flouriſhing trade in fine linen and tapeſtry, and is the capital of a caſtellany, which contains 33 villages. The French laid ſiege to it in 1708, which brought on an obſtinate engagement, wherein they were defeated by the allies under the command of the duke of Marlborough. It was beſieged by the French again in 1744, and taken in a few days; but they reſtored it at the laſt general peace.

OUDRI (Jean Baptiſte), a painter, was born at Paris, and died there May 1. 1755, aged about 74. He acquired the principles of his art under the celebrated Largillieres; and from this maſter he had thoſe ſure principles of colouring which he communicated at a meeting of the academy of painting, of which he was a member, and one of the profeſſors. Oudri's ſuperior talent for painting animals is well known: his compoſitions of this kind are full of truth, and are admirably handled. The Fables of la Fontaine have been engraved in 4 vols folio from his etchings; but thoſe who finiſhed them poſſeſſed not equal abilities. He painted ſeveral hunting-pieces for the king, which adorn ſome of the royal caſtles, among others that of La Meute. Oudri was ſo well acquainted with the magic of his art, that he frequently pleaſed himſelf with painting white objects on white grounds; and theſe pictures have a good effect. He would likewiſe have ſucceeded in hiſtory-painting, as we may eaſily infer from ſeveral pieces which do him honour. He ſuperintended the manufactory of Beauvais, where pieces of tapeſtry were produced equally brilliant with the pictures which had ſerved for their model. The king gave him a penſion, and apartments in the Louvre.

OVERALL (John), a celebrated Engliſh biſhop, was born in 1559; and, after a proper foundation in grammar learning, was ſent to St John's college, Cambridge, and was elected a ſcholar of that ſociety: but afterwards removing to Trinity, was choſen fellow of that college. In 1596 he was made regius profeſſor of divinity, when he took the degree of D. D. and about the ſame time was elected maſter of Catherine-hall. In 1601 he was raiſed to the deanery of St Paul's, London, by the recommendation of his patron Sir Fulk Greville, and Queen Eliſabeth; and in the beginning of King James's reign, he was choſen prolocutor of the lower houſe of convocation. In 1612 he was appointed one of the firſt governors of the Charter-houſe hoſpital, then juſt founded by Thomas Sutton, Eſq. In April 1614 he was made biſhop of Litchfield and Coventry; and in 1618 he was tranſlated to Norwich, where he died in May 1619, aged, as it is reported, 60 years He was buried in that cathedral, where he lay unnoticed and forgotten till ſome time after the reſtoration of Charles II. when Coſin, biſhop of Durham, who had been his ſecretary, erected a monument in 1669, with a Latin inſcription, in which he is ſaid to be, "Vir undequaque doctiſſimus, et omni encomio major."

Wood obſerves, that he had the character of being the beſt ſcholaſtic divine in England; and Coſin, who perhaps may be thought to rival him in that ſort of learning, calls himſelf his ſcholar, and abſolutely ſays that he derived all his knowledge from him. He is alſo celebrated by Smith for his diſtinguiſhed wiſdom, erudition, and piety. In the controverſy which in his time divided the reformed churches about predeſtination and grace, he held a middle opinion, inclining perhaps to Arminianiſm. He ſeems indeed to have paved the way for the reception of that doctrine in England, where it was generally embraced a few years afterwards, chiefly by the authority and influence of Archbiſhop Laud. Overall cultivated a particular friendſhip with Gerard Voſſius and Grotius; and was much grieved to ſee the love of peace, and the projects of this laſt great man to obtain it, ſo ill repaid. He laboured heartily himſelf to ſettle the differences in Holland, upon what is known by the name of the *Quinquarticular controverſy;* as appears in part by his letters to the two learned correſpondents juſt mentioned, ſome of which are printed in the *Epiſtolæ præſtantium virorum*, &c.

The biſhop is known in England chiefly by his *Convocation Book*, of which Biſhop Burnet gives the following account: "This book was wrote on the ſubject of government, the divine inſtitution of which was very poſitively aſſerted. It was read in convocation, and paſſed by that body, in order to the publiſhing of it; in oppoſition to the principles laid down in the famous book of Parſons the Jeſuit, publiſhed under the name of *Doleman*. But King James did not like a convocation entering into ſuch a theory of politics; ſo he diſcouraged the printing of it, eſpecially ſince, in order to juſtify the owning of the United Provinces, who had lately thrown off the Spaniſh yoke, to be a lawful government, it was laid down, that when a change of government was brought to a thorough ſettlement, it was then to be owned and ſubmitted to as a work of the providence of God. Here it ſlept, till Archbiſhop Sancroft, who had got the book into his own hands, and not obſerving the laſt-mentioned paſſage in it, reſolved to publiſh it in the beginning of King William's reign, as an authentic declaration the church of England had made in the point of non-reſiſtance. Accordingly it was publiſhed in 4to, as well as licenſed, by him, a very few days before he was under ſuſpenſion for not taking the oaths."

OVERBURY (Sir Thomas), a learned and worthy Engliſh gentleman, was born in 1581; and ſtudied at Queen's college, Oxford, after which he removed to the Middle-Temple, London. He afterwards travelled for ſome time, and returned a moſt accompliſhed perſon; when he contracted an intimate acquaintance with Sir Robert Carr, knight of the Bath, who being ſoon after taken into his majeſty's favour, had Mr Overbury knighted at Greenwich. Sir Thomas perceiving the familiarity which ſubſiſted between his patron Carr, now made viſcount Rocheſter, and the lady Frances, the wife of Robert earl of Eſſex, was ſo much diſpleaſed at it, that he endeavoured to diſſuade him from keeping her company, and from proceeding in the baſe deſign he had formed of having her firſt divorced from her huſband, and then marrying her. The viſcount, reſenting this honeſt advice, told what he had ſaid to the lady, who was as remarkable for her wickedneſs as for her beauty; on which they immediately reſolved on his deſtruction. About this time, the king wanting to ſend an ambaſſador abroad, the viſcount recommended Sir Thomas Overbury. His majeſty approving the choice, the viſcount imparted the king's intentions to Sir Thomas; but, under a treacherous ſhow of friendſhip, diſſuaded him from accepting of that employment, as it might hinder him from a better way of advancement; promiſing that he would prevent his majeſty from being diſpleaſed at his refuſal. The viſcount then went to the king, and artfully incenſing his majeſty againſt Sir Thomas for refuſing to obey his commands, that gentleman was committed to the Tower for his contempt, on the 21ſt of April 1613, where he continued till he was diſpatched by poiſon on the 15th of September following, and his body was interred in the Tower-chapel the ſame day. About two years after, the whole contrivance of his death was diſcovered. On this ſeveral perſons were condemned and executed; but though Carr, earl of Somerſet, and the lady Frances his counteſs, were condemned to death for contriving the murder, and hiring the perſons who were concerned in it, the king only baniſhed them from court, and afterwards pardoned them. Sir Thomas Overbury wrote ſeveral poems, &c. and an account of his travels.

His character is repreſented by an hiſtorian of thoſe times; who, after relating the occaſion and circumſtances of his death, proceeds in the following terms: "In this manner fell Sir Thomas Overbury, worthy of a longer life and a better fate; and, if I may compare private men with princes, like Germanicus Cæſar, both by poiſon procured by the malice of a woman, both about the 33d year of their age, and both celebrated for their ſkill and judgment in poetry, their learning, and their wiſdom. Overbury was a gentleman of an ancient family, but had ſome blemiſhes charged upon his character, either through a too great ambition, or the inſolence of a haughty temper.—— After the return from his travels, the viſcount Rocheſter embraced him with ſo entire a friendſhip, that, exerciſing by his majeſty's ſpecial favour the office of ſecretary proviſionally, he not only communicated to Sir Thomas the ſecrets, but many times gave him the packets and letters unopened, before they had been peruſed by the king himſelf: which as it prevailed too much upon his early years, ſo as to make him, in the opinion of ſome, thought high and ambitious; yet he was ſo far from violating his truſt and confidence, that he remains now one example among others who have ſuffered in their perſons or their fortunes for a freedom of advice, which none but ſincere friends will give, and which many are ſuch ill friends to themſelves as not to receive."

OVEN, a kind of domeſtic furnace, uſed for baking bread, pies, tarts, &c. of a circular ſtructure, with a very low roof, well lined, both on the top, bottom, and ſides, with ſtone; it has a ſmall entrance in the front, which is exactly fitted by a kind of door, which being clapped to the mouth of the oven confines the heat, while bread, pies, or puddings, are baking. Over this, paſtry cooks, &c. have another oven built much in the ſame manner, which is uſed for ſuch things as require a leſs degree of heat. Ovens are heated by burning dry wood, faggots, &c. in them, till all the parts are equally hot.

OVER-HAULING, the act of opening and extending the ſeveral parts of a tackle, or other aſſemblage of ropes, communicating with blocks or dead eyes. It is uſed to remove thoſe blocks to a ſufficient diſtance from each other, that they may be again placed in a ſtate of action, ſo as to produce the effect required.

Over-Hauling, is alſo vulgarly expreſſed of an examination or inſpection into the condition of a perſon or thing.

Over-Rake, among ſeamen: When a ſhip riding at anchor ſo overbeats herſelf into an high ſea, that ſhe is waſhed by the waves breaking in upon her, they ſay the waves over-rake her.

Over-Reach, in Farriery. See there, § xl. 2.

OVERSMAN, in Scots law, a perſon appointed by arbiters, or by the parties ſubmitters, to determine the matter ſubmitted, in caſe the parties diſagree in their opinion.

OVERT, the ſame with Open: Thus an overt act ſignifies an act which, in law, muſt be clearly proved; and ſuch is to be alleged in every indictment for high treaſon.

OVERTURE, or Ouverture, opening or preluding: a term uſed for the ſolemnities at the beginning of a public act or ceremony; an opera, tragedy, comedy, concert of muſic, &c. The overture of the theatre or ſcene, is a piece of muſic uſually ending with a fugue: the overture of a jubilee is a general proceſſion, &c.

OVERYSSEL, ſo named from its ſituation beyond the river Yſſel, one of the Seven united Provinces; bounded on the eaſt by the biſhopric of Munſter, on the north by Frieſland and the territory of Groningen, on the weſt by the river Yſſel, and on the ſouth by the county of Zutphen and the biſhopric of Munſter. It is divided into three diſtinct parts; which are the territories of Drenſe, Twente, and Salland. There are many moraſſes in this province, and but few inhabitants, in compariſon of the reſt. Its greateſt riches conſiſt in turfs; which are dug up here, and ſent to the neighbouring provinces, particularly Holland. It extends near 60 miles in length from north to ſouth, and 40 in breadth from eaſt to weſt. The whole country is low and marſhy, but it produces a tolerable quantity of corn. It was formerly a dependance of the biſhopric of Utrecht, before Henry of Bavaria, biſhop of that ſee, transferred the ſovereignty of it to the emperor Charles V.

OVIEDA, in botany: A genus of the angioſpermia order, belonging to the didynamia claſs of plants; and in the natural method ranking under the 40th order, *Perſonatæ*. The calyx is quinquefid; the tube of the corolla almoſt cylindrical above, and very long; the berry globoſe and diſpermous.

OVIEDO, a town of Spain, and capital of Aſturias d'Oviedo, with a biſhop's ſee, and an univerſity; ſeated at the confluence of the rivers Ove and Deva, which form the Aſta, 50 miles north-weſt of Leon, and 208 north-weſt of Madrid. W Long. 5. 47. N. Lat. 43. 23.

OUGHTRED (William), an eminent mathematician, was born at Eton in 1573, and educated in the ſchool there, whence he was elected to King's-college in Cambridge, of which he afterwards became fellow. Being admitted to holy orders, he left the univerſity about the year 1603, and was preſented to the rectory of Aldbury, near Guildford in Surry; and about the year 1628 was appointed by the Earl of Arundel to inſtruct his ſon in the mathematics. He kept a correſpondence by letters with ſome of the moſt eminent ſcholars of his time upon mathematical ſubjects; and the moſt celebrated mathematicians of that age owed moſt of their ſkill to him, whoſe houſe was full of young gentlemen that came from all parts to receive his inſtruction. It is ſaid that, upon hearing the news of the vote at Weſtminſter for the reſtoration of King Charles II. he expired in a ſudden tranſport of joy, aged 88. He wrote, 1. *Clavis Mathematica;* which was afterwards publiſhed in England. 2. A deſcription of the double horizontal dial. 3. *Opuſcula Mathematica;* and ſeveral other works. He left alſo behind him a great number of papers upon mathematical ſubjects, which are now in the muſeum of William Jones, Eſq; F. R. S.

David Lloyd, in his Memoirs, has given the following ſhort character of him: "That he was as facetious in Greek and Latin, as ſolid in arithmetic, geometry, and the ſphere of all meaſures, muſic, &c. exact in his ſtyle as in his judgment; handling his tube and other inſtruments at 80 as ſteadily as others did at 30; owing this, as he ſaid, to temperance and archery; principling his people with plain and ſolid truths, as he did the world with great and uſeful arts; advancing new inventions in all things but religion, which, in its old order and decency, he maintained ſecure in his privacy, prudence, meekneſs, ſimplicity, reſolution, patience, and contentment." He had one ſon, whom he put an apprentice to a watchmaker, and wrote a book of inſtructions in that art for his uſe.

OVID, or *Publius Ovidius Naſo*, a celebrated Latin poet of the Auguſtan age, was a Roman knight, born at Sulmo, in the 43d year before the Chriſtian era. He ſtudied rhetoric under Aurelius Fuſcus, and for ſome time frequented the bar. His progreſs in the ſtudy of eloquence was great, but the father's expectations were fruſtrated; his ſon was born a poet, and nothing could deter him from purſuing his natural inclination to write poetry, though he was often reminded that Homer lived and died in the greateſt poverty. Every thing he wrote was expreſſed in poetical numbers, as he himſelf ſays, *Et quod tentabam ſcribere verſus erat.* A lively genius and a fertile imagination ſoon gained him admirers: the learned became his friends; Virgil, Propertius, Tibullus, and Horace, honoured him with their correſpondence, and Auguſtus patronized him with the moſt unbounded liberality. Theſe favours, however, were but momentary; for after having obtained the eſteem of Auguſtus, he incurred his diſpleaſure, and was baniſhed to Tomos, a city on the Pontus Euxinus, near the mouth of the Danube, when he was 50 years of age. The true cauſe of this ſudden exile is unknown. Some attribute it to a ſhameful amour with Livia the wife of Auguſtus, while others ſuppoſe that it aroſe from the knowledge which Ovid had of the unpardonable inceſt of the emperor with his daughter Julia. Theſe reaſons are indeed merely conjectural; the cauſe was of a very private and very ſecret nature, of which Ovid himſelf is afraid to ſpeak. It was, however, ſomething improper in the family and court of Auguſtus, as theſe lines ſeem to indicate:

Cur aliquid vidi? Cur noxia lumina feci?
Cur imprudenti cognita culpa mihi eſt?

Inſcius Actæon vidit ſini veſte Dianam,
Præda fuit canibus non minus ille ſuis.

Again,

Inſcia quod crimen viderunt lumina plector,
Peccatumque oculos eſt habuiſſe meum.

And in another place,

Perdiderunt cum me duo crimina, carmen & error,
Alterius facti culpa ſilenda mihi eſt.

In his baniſhment, Ovid betrayed his puſillanimity in a great degree; and however affected and diſtreſſed his ſituation was, yet the flattery and impatience which he ſhowed in his writings are a diſgrace to his pen, and lay him more open to ridicule than to pity. Though he proſtituted his pen and his time to adulation, yet the emperor proved deaf to all intreaties, and refuſed to liſten to his moſt ardent friends at Rome who wiſhed for his return. Ovid, who really wiſhed for a Brutus to deliver Rome of her tyrannical Auguſtus, ſtill continued his flattery even to meanneſs; and when the emperor died, he was ſo mercenary as to conſecrate a ſmall temple to the departed tyrant on the ſhore of Euxine, where he regularly offered frankincenſe every morning. Tiberius proved as regardleſs as his predeceſſor to the intreaties which were made for the poet, and he died in the ſeventh or eighth year of his baniſhment, in the 57th year of his age. He was buried at Tomos. In the year 1508 of the Chriſtian era, the following epitaph was diſcovered at Stain, in the modern kingdom of Auſtria.

Hic ſitus eſt vates quem Divi Cæſaris ira.
Auguſti patria cedere juſſit humo.
Sæpe miſer voluit patriis occumbere terris,
Sed fruſtra! hunc illi fata dedere locum.

This, however, is an impoſition to render celebrated an obſcure corner of the world, which never contained the bones of Ovid. The greateſt part of his poems are remaining. His *Metaphorphoſes*, in 15 books, are extremely curious, on account of the great variety of mythological facts and traditions which they relate, but they can have no claim to epic honours. In compoſing this the poet was more indebted to the then exiſting traditions, and to the theogony of the ancients, than the powers of his own imagination. His *Faſti* were divided into 12 books, like the conſtellations in the zodiac, but of theſe ſix are loſt; and the learned world have reaſon to lament the loſs of a poem which muſt have thrown ſo much light upon the religious rites and ceremonies, feſtivals and ſacrifices, of the ancient Romans, as we may judge from the ſix that have ſurvived the ravages of time and barbarity. His *Triſtia*, which are divided into five books, contain much elegance and ſoftneſs of expreſſion; as alſo his *Elegies* on different ſubjects. The *Heroides* are nervous, ſpirited, and diffuſe; the poetry is excellent, the language varied, but the expreſſions are often too wanton and indelicate; a fault which is very common with him. His three books *Amorum*, and the ſame number *de Arte Amandi*, with the other *de Remedio Amoris*, are written with peculiar elegance, and contain many flowery deſcriptions; but the doctrine which they hold forth is dangerous, and they are to be read with caution, as they ſeem to be calculated to corrupt the heart, and to ſap the very foundations of virtue and morality. His *Ibis*, which is written in imitation of a poem of Callimachus of the ſame name, is a ſatyrical performance. Beſides theſe, there are extant ſome fragments of other poems, and among theſe part of a tragedy called *Medea*. The talents of Ovid as a dramatic writer has been diſputed, and ſome have remarked that he who is ſo often void of ſentiment was not born to ſhine as a tragedian. He has attempted, perhaps, too many ſorts of poetry at once. On whatever he has written, he has totally exhauſted the ſubject. He everywhere paints nature with a maſterly hand, and adds ſtrength even to vulgar expreſſions. It has been judiciouſly obſerved, that his poetry after his baniſhment from Rome was deſtitute of that ſpirit and vivacity which we admire in thoſe which were written before. His *Faſti* are perhaps the beſt written of all his poems; and after them we may fairly rank his love verſes, his *Heroides*, and after all his *Metamorphoſes*, which were not totally finiſhed when Auguſtus baniſhed him. His *Epiſtles from Pontus* are the language of a weak and ſordid flatterer. However critics may have cauſe to cenſure the indelicacy and the inaccuracies of Ovid, it is to be acknowledged that his poetry contains great ſweetneſs and elegance, and, like that of Tibullus, charms the ear and captivates the mind.—Another perſon of the name of Ovid accompanied his friend Cæſonius when baniſhed from Rome by Nero.

OVIEDO (John Gonſalvez de), born at Madrid about the year 1478, was educated among the pages of Ferdinand king of Arrogan and Iſabella queen of Caſtile; and happened to be at Barcelona in 1493, when Chriſtopher Columbus returned from his firſt voyage to the iſland Haiti, which he called Hiſpaniola, and which now goes by the name of St Domingo. He formed an intimate acquaintance with Columbus and his companions, and was at pains to inform himſelf of every thing relating to the new diſcoveries. He rendered ſuch eſſential ſervice to Spain during the war of Naples, that Ferdinand determined to ſend him to the iſland of Haiti, as intendant and inſpector general of the trade of the New World. The ravages which the venereal diſeaſe had made during that war, induced him to inquire into what were the moſt efficacious remedies for this malady, which was ſuppoſed to have come from the Weſt Indies. His inquiries were extended to every thing which regards the natural hiſtory of theſe regions; and, on his return to Spain, he publiſhed *Summario de la Hiſtoria general y natural de las Indias Occidentales*, which he dedicated to Charles V. He afterwards made ſome additions to this work, which he publiſhed under the title of *La Hiſtoria general y natural de las Indias Occidentales*; Salamanca, 1535, folio. It was tranſlated into Italian, and afterwards into French; Paris, 1556, folio. In this work, Oviedo ſays that the French pox is endemical in the iſland of Haiti, and that it has paſſed from thence into Europe. He greatly extols the uſe of the wood of guiacum for the cure of this diſeaſe; but whether the diſeaſe is now become more obſtinate, or the remedy does not poſſeſs that efficacy which is aſcribed to it, it is at preſent in little eſtimation.

OVILIA, or Septa, in ancient Rome, a place in the Campus Martius, at firſt railed in like a ſheep-pen, whence its name. Afterwards it was mounted with marble, and beautified with walks and galleries, as alſo with a tribunal, or ſeat of juſtice. Within this precinct or incloſure the people were called to give their ſuffrages for the election of magiſtrates. The aſcent into the ovilia was not by ſtairs, but by pontes, or narrow boards, laid there for the occaſion; on which account *de ponte dejici*, ſignified "to be deprived of the privilege of voting;" and perſons thus dealt with were called *depontani*.

OVIPAROUS, a term applied to ſuch animals as bring forth their young from eggs; as birds, inſects, &c.

OVIS, the SHEEP, in Zoology, a genus of the mammalia claſs, and of the order of Pecora; the characters of which are theſe: The horns are concave, turned backwards, and full of wrinkles; there are eight fore-teeth in the under-jaw, and no dog-teeth The wool of theſe animals is only a congeries of very long and ſlender hairs, oddly twiſted and contorted, and variouſly interwoven with one another. This, as far as is yet known, is a clothing peculiar to the ſheep kind, no other animal having been ſeen to poſſeſs it. It is not, however, the clothing of all the ſpecies of ſheep, ſome that are found in diſtant nations having ſhort hair like that of the goat.

Plate CCCLXX. Linnæus enumerates three ſpecies, which are perhaps only varieties, viz. 1. The *ovis aries*, or ram ſheep, the horns of which are ſhaped like a half moon, and compreſſed. 2. The *ovis Guineenſis*, or Guinea ſheep, which has pendulous ears, lax hairy dewlaps, and a prominence on the hind part of the head. The wool is ſhort like that of a goat. It is, as its name imports, a native of Guinea. And, 3. The *ovis ſtrepſiceros*, or Cretan ſheep, which has ſtrait cariated horns, twiſted in a ſpiral manner, and is a native of Mount Iola. According to Mr Pennant, the laſt two are to be reckoned only varieties.

The ſheep, unqueſtionably a mild and gentle creature, is alſo repreſented by Buffon as the moſt ſtupid, defenceleſs, and timid of all quadrupeds; inſomuch that, without the aſſiſtance of man, it could never, he thinks, have ſubſiſted or continued its ſpecies in a wild ſtate.

Buff. Nat. Hiſt. vol. iii. p. 403 "The female is abſolutely devoid of every art and of every mean of defence. The arms of the ram are feeble and awkward. His courage is only a kind of petulence, which is uſeleſs to himſelf, incommodious to his neighbours, and is totally deſtroyed by caſtration. The wedder is ſtill more timid than the ram. It is fear alone that makes ſheep ſo frequently aſſemble in troops: upon the ſmalleſt unuſual noiſe, they run cloſe together; and theſe alarms are always accompanied with the greateſt ſtupidity. They know not how to fly from danger, and ſeem not even to be conſcious of the hazard and inconvenience of their ſituation. Wherever they are, there they remain obſtinately fixed; and neither rain nor ſnow can make them quit their ſtation. To force them to move or to change their route, they muſt be provided with a chief, who is taught to begin the march: the motions of this chief are followed, ſtep by ſtep, by the reſt of the flock. But the chief himſelf would alſo continue immoveable, if he were not puſhed off by the ſhepherd, or by his dog, an animal which perpetually watches over their ſafety, which defends, directs, ſeparates, aſſembles, and, in a word, communicates to them every movement neceſſary to their preſervation.

"Of all quadrupeds, therefore, ſheep are the moſt ſtupid, and derive the ſmalleſt reſources from inſtinct. The goat, who ſo greatly reſembles the ſheep in other reſpects, is endowed with much more ſagacity. He knows how to conduct himſelf on every emergency: he avoids danger with dexterity, and is eaſily reconciled to new objects. But the ſheep knows neither how to fly nor to attack: however imminent her danger, ſhe comes not to a man for aſſiſtance ſo willingly as the goat; and to complete the picture of timidity and want of ſentiment, ſhe allows her lamb to be carried off, without attempting to defend it, or ſhowing any marks of reſentment. Her grief is not even expreſſed by any cry different from that of ordinary bleating."

The annotator upon this article in the Edinburgh tranſlation of Buffon, denies the above to be the natural character of the animal. "All tame animals (he obſerves) loſe a portion of that ſagacity, *Ibid.* p. 464. *notes.* dexterity, and courage, which they are obliged to employ againſt their enemies in a wild ſtate; becauſe they have been long accuſtomed to rely upon the protection of man. Sheep, when enſlaved by men, tremble at the voice of the ſhepherd or his dog. But, on thoſe extenſive mountains where they are allowed to range without controul, and where they ſeldom depend on the aid of the ſhepherd, they aſſume a very different mode of behaviour. In this ſituation, a ram or a wedder boldly attacks a ſingle dog, and often comes off victorious. But when the danger is of a more alarming nature, like man, they truſt not to the proweſs of individuals, but have recourſe to the collected ſtrength of the whole flock. On ſuch occaſions, they draw up into one compact body; they place the young and the females in the centre; and the ſtrongeſt males take the foremoſt ranks, keeping cloſe by each others ſides. Thus an armed front is preſented on all quarters, which cannot be attacked without the greateſt hazard of deſtruction. In this manner, they wait, with firmneſs and intrepidity, the approach of the enemy. Nor does their courage fail them in the moment of attack. For, if the aggreſſor advances within a few yards of the line, the ram darts upon him with ſuch impetuoſity, as lays him dead at their feet, unleſs he ſaves himſelf by flight. Againſt the attacks of ſingle dogs, or foxes, they are, when in this ſituation, perfectly ſecure. Beſides, a ram, regardleſs of danger, often engages a bull, and never fails to conquer him; for the bull, by lowering his head, without being ſenſible of his defenceleſs condition, receives between his horns the ſtroke of the ram, which uſually brings him to the ground.

"In the ſelection of food, few animals diſcover greater ſagacity than the ſheep; nor does any domeſtic animal ſhow more dexterity and cunning in its attempts to elude the vigilance of the ſhepherd, and to ſteal ſuch delicacies as are agreeable to its palate. When perfectly tamed, and rendered domeſtic, the ſportive gambols and troubleſome tricks of the animal, are too well known to require any deſcription."

As to the accuſations contained in the latter part of the character above quoted, every perſon, it is obſerved,

ved, who has attended to thoſe animals, at leaſt in this country, muſt know that they are not altogether juſt. Ibid. p. 466. notes. "Individuals, in a ſtate of ſubjection, ſeem to have no idea of reſiſting the attacks of an enemy. But they ſoon learn that their protection lies in the ſhepherd or his dog: for, when it becomes neceſſary, in Britain, to watch the folds, in order to prevent aſſaults from foxes or dogs, upon the firſt alarm the whole flock run with violence to the place where the watchmen are ſtationed; ſo that, when they chance to ſleep, they are often hurt by the ſheep trampling upon them. On other occaſions, they never chooſe to make a very cloſe approach either to men or dogs; but the ſenſe of immediate danger makes them forget their uſual timidity, and their ſagacity teaches them where their ſafety lies. When the female is robbed of her lamb, ſhe bleats in a manner that ſtrongly marks the anguiſh ſhe feels. In the eagerneſs of her ſearch, her eye-balls ſeem to ſtart from their ſockets; and her irregular and diſtracted motions, joined to the violence and conſtancy of her bleatings, are evident indications of the moſt pungent grief."

Ibid. p. 467. &c. "Theſe animals (continues the Count in the ſame captious ſtyle as before), ſo ſimple and dull in their intellect, are likewiſe very feeble in their conſtitution. They cannot continue long in motion. Travelling weakens and extenuates them. When they run, they pant, and ſoon loſe their breath. The ardour of the ſun is equally incommodious to them as moiſture, froſt, and ſnow. They are ſubject to many diſeaſes, moſt of which are contagious. A redundancy of fat often kills them, and always renders the ewes barren. They bring forth with difficulty; frequently miſcarry, and require more care than any other domeſtic animal." Ibid. p. 468. notes. To which the annotator anſwers, "This is unqueſtionably another exaggeration. The ſheep, when nearly in a wild ſtate, is a robuſt, active animal, and capable of enduring much fatigue without injury. But, when immerſed in luxury, and pampered in rich paſtures, like creatures of a higher nature, the ſheep becomes overloaded with fat, and contracts diſeaſes which are not natural to him: beſides, no tamed animal requires or receives leſs aſſiſtance in bringing forth its young; for in thoſe parts of Britain where the beſt ſheep are bred, they are never houſed, nor, during the lambing ſeaſon, have any thing adminiſtered to them but their ordinary paſture. When in health, ſheep have no occaſion for water: in our northern climates, it is even injurious to them."

On the whole, many of Buffon's obſervations and aſſertions on this article appear to be haſty, and, we preſume, very ill founded. Reſpecting ſheep, the learned Count ſeems to have been ſtrangely miſinformed, or groſsly prejudiced. We eſteem him as a great and an ingenious man, but we do not think that the celebrity of a name can add ſtrength to weakneſs, or make that be taken for granted on a bare aſſertion which wants proof, or which is contrary to experience, the boaſted guide of modern philoſophers. The *objections* and *accuſations* of this great naturaliſt are well obviated by his learned tranſlator. The great error of Buffon ſeems to lie in his conſidering ſheep in a domeſtic ſtate, and as they exiſt among us, without any reference to them in a ſtate of nature, and without ſuppoſing or allowing their exiſtence in ſuch a ſtate (A). That he was wrong in this reſpect, a very little reflection will convince us; and indeed his tranſlator has ſhown it in a very ample manner, by recurring to facts, which is the only legitimate way of reaſoning upon this or any ſubject of this nature. To ſet this matter in a ſtill ſtronger point of view, however, we ſhall give the following account of the Siberian *argali*, or wild ſheep, as it appeared in the 16th volume of a periodical work intitled *the Bee*; being extracted by a correſpondent from the works of the celebrated naturaliſt Dr Pallas, who has paid particular attention to this part of his profeſſion.

This accurate obſerver "found the *ovis fera*, or wild ſheep, in all its native vigour, boldneſs, and activity, inhabiting the vaſt chain of mountains which run through the centre of Aſia to the eaſtern ſea, and the branches which it ſends off to Great Tartary, China, and the Indies. This wild animal, which our learned naturaliſt declares to be the *muſimon* of Pliny, and the *ophion* of the Greeks, is called *argali* by the Siberians, which means wild ſheep: and by the Ruſſians *kamennoi barann*, or ſheep of the rocks, from its ordinary place of abode. It delights in the bare rocks of the Aſiatic chain juſt mentioned, where it is conſtantly found baſking in the ſun; but it avoids the woods of the mountains, and every other object that would intercept the direct rays of the glorious luminary. Its food is the Alpine plants and ſhrubs it finds amongſt he rocks. The argali prefers a temperate climate, although he does not diſdain that of Aſiatic Siberia, as he there finds his favourite bare rocks, ſunſhine, and Alpine plants; nay, he is even fonnd in the cold eaſtern extremity of Siberia and Kamtſchatka; which plainly proves that nature has given a moſt extenſive range to the ſheep in a wild ſtate, equal even to what ſhe has given to man, the lord of the creation; a fact that ought to make us ſlow in believing the aſſertions not uncommon, which tend to prove the ſheep a local animal; or at leaſt that it muſt be confined to certain latitudes, to poſſeſs it in all its value.

"The argali loves ſolitude, or poſſibly perfect liberty, and therefore flees the haunts of all ſubduing man; hence it gradually abandons a country in proportion as it becomes peopled, if no unſurmountable obſtacle obſtructs its flight; inſomuch that Dr Pallas thinks that nothing but the ſurrounding ſea can account for the wild ſheep being found in an inhabited iſland, as is ſometimes the caſe. The ewe of the argali brings forth before the melting of the ſnow. Her lamb reſembles much a young kid: except that it has a large flat protuberance in place of horns, and that it is covered with a woolly hair, frizzled, and of a dark grey. There is no animal ſo ſhy as the argali, which it is almoſt impoſſible to overtake on ſuch

ground

(A) In his account of ſheep this is literally true, though, for the purpoſe of ſupporting a favourite hypotheſis, he does mention the *argali*, or, as he calls it, *mouſlon*; and aſſerts that it is the parent of all the domeſtic varieties: but this, in our opinion, only makes his obſervations in this place more unccountable at leaſt, if not inconſiſtent. See below note (C).

ground as it keeps to. When purſued, it does not run ſtraight forward, but doubles and turns like a hare, at the ſame time that it ſcrambles up and over the rocks with wonderful agility. In the ſame proportion that the adult argali is wild and untameable, the lamb is eaſily tamed when taken young, and fed firſt on milk, and afterwards on fodder, like the domeſtic ſheep, as has been found on numerous experiments made in the Ruſſian ſettlements in theſe parts.

"This animal formerly frequented the regions about the upper Irtiſh, and ſome other parts of Siberia, where it is no longer ſeen ſince colonies have been ſettled in theſe countries. It is common in the Mongalian, Songarian, and Tartarian mountains, where it enjoys its favourite ſolitude or liberty. The argali is found likewiſe on the banks of the Lena, up as high as 60 degrees of north latitude; and it propagates its ſpecies even in Kamtſchatka, as noticed before. The argali is alſo found in the mountains of Perſia, and is ſaid to obtain in the Kuril iſlands in great ſize and beauty. It purges itſelf in the ſpring (like all the domeſtic varieties of the ſheep, when left at liberty to follow their inſtinct) with acrid plants of the anemonoide kind, till milder plants ſpring up, and ſhrubs begin to ſprout, which with Alpine plants conſtitute its uſual food. It likewiſe frequents the ſalt marſhes which abound everywhere in Siberia; and even licks the ſalt efflorescence that riſes on the ground, a regimen that fattens them up very quickly, and fully reſtores the health, vigour, and fleſh they had loſt during winter, and during the purging courſe, which, together with the reſtorative, is by the Almighty ſo wonderfully dictated to the ſheep ſpecies, whether in a wild or tame ſtate, if left to roam at large where the neceſſary plants are to be found." Here, then, we have a variety of the ſheep ſpecies, which by ſome indeed, and by Dr Pallas among others, is thought to be the parent of all our domeſtic varieties, and which lives and propagates without any aid from man, and which on all occaſions carefully ſhuns him. That it is the parent ſheep we are not convinced; that being an opinion which requires proof, and better proof than we preſume the abettors of it are able to produce.

Having given a figure of this animal (ſee Plate CCCLXXI.), we ſhall add the following deſcription of it, taken likewiſe from the Bee. The argali is about the height of a ſmall hart, but its make is much more robuſt and nervous. Its form is leſs elegant than that of the deer, and its legs and neck ſhorter. The male is larger than the female, and every way ſtouter. Its head reſembles that of a ram, with long ſtraggling hairs about the mouth; but no beard. Its ears are rather ſmaller than thoſe of a ram. The horns are exactly repreſented in the Plate; they weigh in an adult ſometimes 16 pounds. The tail is very ſhort. The ſummer-coat conſiſts of ſhort hair, ſleek, and reſembling that of a deer. The winter-coat conſiſts of wool like down, mixed with hair everywhere an inch and an half long at leaſt, concealing at its roots a fine woolly down, generally of a white colour. The colour of its coat was in general of a dark greyiſh brown, with white tips to the longer hairs, and conſiſted of hair mixed with wool, of a dark iron grey. By accounts lately received from the Tſhutſki, the argali is found of a white colour on the continent of America, oppoſite to their country. It is likewiſe of a whitiſh colour at Kamtſchatka.

But independent of its manners or its mental qualities, this animal is of the moſt extenſive utility to man. We are clothed by its fleece. The fleſh is a delicate and wholeſome food. The ſkin, dreſſed, forms different parts of our apparel; and is uſed for covers of books. The entrails, properly prepared and twiſted, ſerve for ſtrings for various muſical inſtruments. The bones calcined (like other bones in general), form materials for teſts for the refiner. The milk is thicker than that of cows, and conſequently yields a greater quantity of butter and cheeſe; and in ſome places is ſo rich, that it will not produce the cheeſe without a mixture of water to make it part from the whey. The dung is a remarkably rich manure; inſomuch that the folding of ſheep is become too uſeful a branch of huſbandry for the farmer to neglect. Nature, in ſhort, has given this animal nothing that does not redound to our benefit.

The ram is capable of generation at the age of 18 months; and the ewe can be impregnated when a year old. One ram is ſufficient, according to Buffon, for 25 or 30 ewes; they have often been known indeed to beget 100 lambs in a ſingle ſeaſon. He ought to be large and well proportioned; his head ſhould be thick and ſtrong, his front wide, his eyes black, his noſe flat, his neck thick, his body long and tall, his teſticles maſſy, and his tail long (B). White is the beſt colour for a ram. The ewes whoſe wool is moſt plentiful, buſhy, long, ſoft, and white, are moſt proper for breeders, eſpecially when at the ſame time they are of a large ſize, have a thick neck, and move nimbly.

In this climate ewes fed in good paſtures admit the ram in July or Auguſt; but September or October are the months when the greateſt part of our ewes, if left to nature, take the ram. They go with young about five months, and generally bring forth but one at a time, though frequently two: in warm climates they may bring forth twice in a year; but in Britain, France, and moſt parts of Europe, only once. They give milk plentifully for ſeven or eight months. They live from 10 to 12 years: they are capable of bringing forth as long as they live, when properly managed; but are generally old and uſeleſs at the age of ſeven or eight years. The ram, though he lives 12 or 14 years, becomes unfit for propagating when eight years old.

(B) Buffon ſays, "he ſhould be garniſhed with horns; for hornleſs animals, of which there are ſome in our climates, are leſs vigorous and leſs proper for propagating." On this the annotator obſerves, that "there are many breeds of ſheep in which both males and females want horns; yet they are as vigorous as any of the ſpecies. The largeſt and fineſt ſheep in England have no horns. In ſome counties, the inhabitants are perfectly unacquainted with horned ſheep; in other places, a ſheep without horns is as great a rarity as one with four or ſix horns."

When the male lambs are not intended to be kept for propagation, but fattened for food, they ought to be caſtrated at the age of five or ſix months. This operation is performed two ways: in the one, an inciſion is made, and the teſticles taken out; in the other, a ligature is tied tight round the ſcrotum, above the teſticles, which ſoon deſtroys the veſſels which nouriſh them. After caſtration they are called *wedders*.

The ram, ewe, and wedder, when one year old, loſe the two foreteeth of the under jaw; ſix months afterwards, they loſe the two foreteeth next to theſe; and at the age of three years, the teeth are all replaced. The age of a ram may likewiſe be diſcovered by his horns, which always appear the firſt year, and frequently as ſoon as he is brought forth. Theſe horns uniformly acquire an additional ring every year, as long as the creature lives. The ewes commonly have no horns, but a kind of long protuberances in place of them: however, ſome of them have two and ſome four horns.

Ibid. p.481. &c. "It has been remarked by the ancients (ſays Buffon), that all ruminating animals have ſuet: But this remark, ſtrictly ſpeaking, holds only with regard to the ſheep and goat: The ſuet of the wedder is more copious, whiter, drier, firmer, and better, than that of any other animal. Fat or greaſe is very different from ſuet; the former being always ſoft, while the latter hardens in cooling. The greateſt quantity of ſuet is found about the kidneys; and the left kidney furniſhes more than the right. There are alſo conſiderable quantities in the epiploon or web, and about the inteſtines; but it is not near ſo firm or good as that of the kidneys, the tail, and other parts of the body. Wedders have no other greaſe but ſuet; and this matter is ſo prevalent in their bodies, that their whole fleſh is covered with it. Even the blood contains a conſiderable quantity of ſuet; and the ſemen is ſo charged with it, as to give that liquor a different appearance from that of other animals. The ſemen of men, of the dog, horſe, aſs, and probably of every animal which affords not ſuet, diſſolves with cold; or, when expoſed to the air, becomes more and more fluid from the moment it eſcapes from the body. But the ſemen of the ram, and perhaps of every animal that has ſuet, hardens and loſes its fluidity with its heat.

"In the ſheep, the taſte of the fleſh, the fineneſs of the wool, the quantity of ſuet, and even the ſize of the body, vary greatly in different countries. In France, the province of Berri abounds moſt in ſheep. Thoſe about Beauvais, and in ſome other parts of Normandy, are fatter and more charged with ſuet. They are very good in Burgundy; but the beſt are fed upon the ſandy downs of our maritime provinces. The Italian, Spaniſh, and even the Engliſh wools, are finer than the French wool. In Poitou, Provence, the environs of Bayonne, and ſeveral other parts of France, there is a race of ſheep which have the appearance of being foreign. They are larger, ſtronger, and better covered with wool than the common kind. They are likewiſe more prolific, producing frequently two lambs at a time. The rams of this race engender with the common ewes, and produce an intermediate kind. In Italy and in Spain, there are a great variety of races; but they ought all to be regarded as of the ſame ſpecies with our common ſheep, which, though ſo numerous and diverſified, extend not beyond Europe. Thoſe animals with a long broad tail, ſo common in Aſia and Africa, and which are called *Barbary ſheep* by travellers, appear to be a ſpecies different from the ordinary kind, as well as from the Pacos and Lama of America.

"As white wool is moſt valued, black or ſpotted lambs are generally ſlaughtered. In ſome places, however, almoſt all the ſheep are black; and black lambs are often produced by the commixture of white rams with white ewes. In France, there are only white, brown, black, and ſpotted ſheep; but in Spain, there is a reddiſh kind; and in Scotland there are ſome of a yellowiſh colour. But all theſe varieties of colour are more accidental than thoſe produced by different races; which, however, proceed from the influence of climate, and the difference of nouriſhment."

Reſpecting the varieties, or, as ſome will have it, the different ſpecies of ſheep, there has been a great difference of opinion amongſt the learned. Buffon, we find, in the above extract, if we underſtand him right, regards the variety of races in Italy and in Spain as of the ſame ſpecies with our common ſheep: but he conſiders the Barbary ſheep as a diſtinct ſpecies (c). Dr Pallas, the learned naturaliſt already quoted, in very extenſive travels in the Ruſſian empire, more particularly in Siberia, and amongſt the paſtoral nations of great Tartary, found what he regards as only one ſpecies of ſheep ſubdivided into four varieties, and diſtinguiſhed by their tails, the form of their heads, their ears and fleece. So that he condemns as unfounded and fanciful the erroneous idea of making *ſpecific* differences of the accidental varieties, which, in his opinion, education

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(c) How conſiſtent this opinion is with that which makes the *argali* the parent ſheep, we ſhall not pretend to determine. This hypotheſis he brings forward in the end of the 7th volume of his natural hiſtory*, and as much of it as concerns the preſent ſubject we ſhall here inſert. He concludes, from a ſtrain of reaſoning, ſtrong and plauſible at leaſt, if not abſolutely convincing, that "the temperature of the climate, the quality of the food, and the evils produced by ſlavery, are the three cauſes of the changes and degeneration of animals. The effects of each merit a ſeparate examination; and their relations, when viewed in detail, will exhibit a picture of Nature in her preſent condition, and of what ſhe was before her degradation.

"Let us now compare our pitiful ſheep with the mouflon, from whom they derived their origin. The mouflon, which is the ſame with the argali, is a large animal. He is fleet as a ſtag, armed with horns and thick hoofs, covered with coarſe hair, and dreads neither the inclemency of the ſky, nor the voracity of the wolf. He not only eſcapes from his enemies by the ſwiftneſs of his courſe, but he reſiſts them by the ſtrength of his body, and the ſolidity of the arms with which his head and feet are fortified. How different from our ſheep, who ſubſiſt with difficulty in flocks, who are unable to defend themſelves by their numbers, who cannot endure the cold of our winters without ſhelter, and who would all periſh, if man withdrew his protection? In the warmeſt climates of Aſia and Africa, the mouflon, who is the common parent of

* Edin. edit. 1780

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all the races of this ſpecies, appears to be leſs degenerated than in any other region. Though reduced to a domeſtic ſtate, he has preſerved his ſtature and his hair; but the ſize of his horns are diminiſhed. Of all domeſtic ſheep, thoſe of Senegal and India are the largeſt, and their nature has ſuffered leaſt degradation. The ſheep of Barbary, Egypt, Arabia, Perſia, Calmuck, &c. have undergone greater changes. In relation to man, they are improved in ſome articles, and vitiated in others: But, with regard to nature, improvement and degeneration are the ſame thing; for they both imply an alteration of original conſtitution. Their coarſe hair is changed into fine wool. Their tail, loaded with a maſs of fat, has acquired a magnitude ſo incommodious, that the animals trail it with pain. While ſwollen with ſuperfluous matter, and adorned with a beautiful fleece, their ſtrength, agility, magnitude, and arms, are diminiſhed: Theſe long-tailed ſheep are only half the ſize of the mouflon. They can neither fly from danger, nor reſiſt the enemy. To preſerve and multiply the ſpecies, they require the conſtant care and ſupport of man.

"The degeneration of the original ſpecies is ſtill greater in our climates. Of all the qualities of the mouflon, our ewes and rams have retained nothing but a ſmall portion of vivacity, which yields to the crook of the ſhepherd. Timidity, weakneſs, reſignation, and ſtupidity, are the only melancholy remains of their degraded nature. To reſtore their original ſize and ſtrength, our Flanders ſheep ſhould be united with the mouflon, and prevented from propagating with inferior races; and, if we would devote the ſpecies to the more uſeful purpoſes of affording us good mutton and wool, we ſhould imitate ſome neighbouring nations in propagating the Barbary race of ſheep, which, after being tranſported into Spain, and even into Britain, have ſucceeded very well. Strength and magnitude are male attributes; plumpneſs and beauty of ſkin are female qualities. To obtain fine wool, therefore, our rams ſhould have Barbary ewes; and to augment the ſize, our ewes ſhould be ſerved with the male mouflon."

The learned Count ſeems to ſpeak with more certainty upon this ſubject than the circumſtances of the caſe, or the nature of the facts (as yet far from being fully aſcertained, or completely authenticated), will admit. The editor of the Bee, who is well known to have devoted much time and attention to this ſubject, thus ably expoſes the futility of thoſe arguments which are brought in ſupport of an hypotheſis, which he thinks extremely abſurd, or at leaſt premature. "Buffon (ſays he), who is the leaſt ſcrupulous of all modern naturaliſts, has been the moſt forward to decide in this, as in many other caſes. He does not ſo much as condeſcend to admit that there can be a doubt in this caſe; but on all occaſions aſſumes it as a certainty, that all the varieties of one ſpecies have been derived from one parent; and boldly raiſes upon that ſuppoſition many practical inferences, which, if his theory ſhould prove to be unfounded, might lead to very important errors; ſo that it is not a matter of idle curioſity to inveſtigate this queſtion." He then goes on to ſhow, by ſome particular inſtances, the groſs abſurdity of Buffon's opinion. "Were (continues he) theſe diverſities only caſual, and apt to vary, it might be more eaſy for us to give faith to the hypotheſis; but this is not the caſe. Experience hath fully proved, that any one breed may be kept perfectly uncontaminated for any length of time, with all its diſtinctive peculiarities entire, merely by preventing an intermixture by copulation. Nor is this all: it is alſo known, that if ſuch intermixture be permitted, the deſcendants will undoubtedly be a mixed breed, evidently participating of the qualities and appearances of both their parents. Between a hound and a greyhound, a mongrel breed is obtained which poſſeſſes the ſenſe of ſmelling, though in a leſs degree than the one, and the faculty of fleetneſs in a leſs degree than the other, of its parents; and its whole external appearance evidently indicates at firſt ſight the compound of the ſtock whence it has deſcended. But let a ſmall lap dog and a large maſtiff be fed with the ſame food and tended with the ſame care, the one diſcovers no ſymptoms of increaſing in ſize or diminiſhing it more than the other. Let them be carried from one country to another, they equally preſerve their original diſtinctive qualities, without any farther change than the climate may perhaps produce; which equally ſeems to affect all the varieties of this animal. Never was there adopted an hypotheſis more truly abſurd than that of Buffon in this reſpect. Nor was there ever made ſuch a barefaced attempt to try how far the credulity of mankind could lead them aſtray in deference to a great name, in direct contradiction to facts which fall immediately under the cogniſance of every man who pleaſes but to open his eyes, and look right before him, as in thoſe bold and unfounded aſſertions which he has been pleaſed to make, with regard to the tranſformation of dogs from one variety to another. Yet theſe opinions have been inadvertently tranſcribed many times by learned naturaliſts, without one ſymptom of doubt or heſitation. But can any thing be more contrary to reaſon, exeperience, and facts, that every man has before his eyes every day in his life, than ſuch opinions? It is indeed humiliating for the pride of man, who plumes himſelf on the ſuperiority of reaſon, to remark this. And it is mortifying for modern philoſophy, which affects to be founded on experience and accurate obſervation of facts alone, to point out ſuch things; but truth ought in all caſes to be adhered to.' Though this note has already extended to an undue length, we cannot omit the following obſervations by the ſame patriotic writer: "In regard to ſheep, the varieties of this uſeful claſs of animals ſeem to be conſiderable, and their natural propenſities ſo diſcriminated as to be admirably calculated for adapting them to different ſituations on this globe, ſo as to make them a very univerſal inhabitant of it: and theſe are ſo diverſified as to habits and inſtincts, as education or mode of life, climate, food, and croſſing the breed, have produced in ſheep, as in other animals; and, in conformity to this opinion, he conſiders not only thoſe varieties found in Europe, but alſo thoſe of other quarters of the globe, as only accidental varieties of the ſame ſpecies; and his opinion is confirmed, by finding that they produce a prolific race though the breed be ever ſo much croſſed; which he thinks would not be the caſe were they different ſpecies. The varieties which Dr Pallas examined, which, as we have already ſaid, are four, are as follow. The firſt is named both by the Tartars and Ruſſians *Tſcherkeſſian* ſheep, and by Pallas *dolichura* or long-tailed: it is the *ovis longicauda* of authors.

The ſecond is called the Ruſſian ſheep by the natives, and by Pallas *brachiura* or ſhort-tailed: it ſeems to be the *ovis Iſlandicus* of authors, with ſmaller horns.

The third has no fixed trivial name, as its appellations are as various as the provinces where it is reared; Pallas has called it *ſteatopyga* or fat-tailed: it is the *ovis lauticadata* of authors.

The fourth has likewiſe no fixed trivial name, but Pallas has called it *bucharian*, from finding it reared by the Bucharian Tartars in immenſe flocks. The Tſcherkeſſian ſheep, or firſt variety, is a handſome animal, with a noble air, in its native country and the ſouth of Ruſſia, reſembling in its habits, horns, fleece, and length of tail, the Spaniſh, but more particularly the Engliſh ſheep. Its head is well proportioned, and of an elegant form; ears ſtraight; horns large, even, rounded in the angles, tapering to a point, and bending inwardly towards the back. The rams are ſeldom without horns, and the ewes have them often bent in a lunar form. The wool, though coarſe, is without admixture of hair, which is perhaps but an accidental diſtinction, and promiſes to be much meliorated by croſſing the breed, and rearing the animal with more care and ſkill. It is even known to become much finer without the aſſiſtance of art, merely from the influence of a temperate climate, as on mount Caucaſus. The tail of the ram is covered with fine long wool, like the Indian ſheep deſcribed by Buffon, which trails on the ground, ſo as to efface the prints made by the animal's feet on ſand, and it contains often 20 joints or vertebræ. In paſſing from the ſtate of nature to that of ſervitude it ſeems to have loſt its native ferocity, together with its coarſe fleece. Dr Pallas ſays it is a mild gentle animal, and is leſs *degenerated in form* from the argali, which, according to his ſyſtem, is the parent ſpecies, than the ſteatopyga, which on the other hand has preſerved much more of its wildneſs than the Tſcherkeſſian; perhaps becauſe it is allowed to range with little reſtraint on the wide extended plains of Great Tartary. The Tſcherkeſſian is reared in all the European regions of the Ruſſian empire, ſituated on this ſide the river Occa, in the nearer Poland, and by the paſtoral people of mount Caucaſus; and they are commonly of a white colour.

The ſame variety, we are told by Ruſſel, in his natural hiſtory of Aleppo, is reared under the name of *Bedouin ſheep* by the Arabs, and in the weſtern parts of Mauritania, with a trifling difference in the length and thickneſs of the tail. There are likewiſe ſheep in Morocco, which belong to this variety, on account of the diſtinguiſhing character of it, a long tail, although otherwiſe different, in having an ugly look, head covered entirely with hair, little hanging ears, and remarkably long wool.

The Indian and Guinea ſheep, ſo well deſcribed by Buffon, reſemble the Tſcherkeſſian only in the length of their tail, whilſt in other reſpects they come nearer the ſteatopyga or fat-rumped ſheep of Pallas in ſize, form, and fleece mixed with hair. The learned naturaliſt is of opinion, that the arid burning deſerts produce this change on the wool; but his reaſoning on this head is to us at leaſt as little ſatisfactory as that by which he endeavours to prove the argali to be the parent ſpecies The inhabitants of Ukraine and Padoli carry on an extenſive and valuable traffic with the ſkins of Tſcherkeſſian ſheep, the beauty of which they heighten in a very curious manner.

The *brachiura*, ſhort-tailed, or ſecond variety which Dr Pallas examined in his travels, is reared throughout all the north of Ruſſia, and reſembles that of Iceland in ſize, tail, and coarſeneſs of fleece; but though this be the caſe in theſe few reſpects, yet it differs from it in a very eſſential character, that of *horns*, which are much ſmaller, and have nothing of that exuberance which Buffon and others attribute to the ſheep of that iſland. It reſembles the Tſcherkeſſian ſheep in the form of its head, ſtraight upright ears, and in thickneſs of fleece; but the quality of the two fleeces are very different, this variety having wool almoſt as coarſe as dog's hair: but the great diſtinguiſhing character between them is the tail, which is almoſt a quarter of a yard ſhorter than that of the Tſcherkeſſian. The brachiura, or ſhort-tailed ſheep, is reared not only by the northern Ruſſians, but likewiſe by the Fins and other neighbouring nations. Some of this variety have been tranſported into Siberia, where they have ſupported themſelves on ſome paſtures, though in poor condition; but through all the ſouthern countries they are in leſs eſtimation than the long-tailed and fat-tailed varieties, which are much ſuperior to them for ſize, fat, and good eating. The ewe of this ſhort-tailed variety couples readily with the ram of the ſteatopyga or fat-tailed breed, and produces an animal nobler and larger than its mother, with a tail ſwelled at the baſe with fat, but meagre towards the end like that of the mixed breed, which makes Dr Pallas's fourth and laſt variety of domeſtic ſheep. The ewe alſo couples clandeſtinely with the domeſtic

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as to preſerve the principal breeds very diſtinct, if left in a ſtate of nature. The argali, ſtrong, active, nimble, delights to live among rocks and inacceſſible places; while the large ſluggiſh breed of ſheep, ſuch as thoſe that have been taken into keeping by our countryman Bakewell, could never aſcend theſe ſteeps, but are well calculated to conſume the produce of the fertile plains; there is therefore no chance that theſe two breeds would ever intermingle, if left entirely to themſelves. The laſt of theſe two varieties has indeed been long domeſticated by man, as being utterly incapable of withdrawing itſelf from his ſway, though the firſt has been able to preſerve its independence till the preſent hour in ſome of the mountains and leaſt inhabited diſtricts on the globe." He then goes on to mark the leſſer diſtinctions, in which, however, we cannot follow him.

domeſtic he-goat, and produces an animal much reſembling the mother, but with a fleece of wool and hair. This latter is a fact of the truth of which we have ſome doubt. The Doctor may eaſily have been miſled, and may have adopted his opinion, merely from the ſhaggy appearance of the fleece of ſome breeds of ſheep, which much reſembles the hair of a goat; but theſe are found as well in countries where no goats exiſt, as in thoſe where they abound. The fact has not then, we think, been ſufficiently aſcertained. This variety ſupports extremely well the ſeverity of a northern climate; and Dr Pallas doubts not but it might paſs the winter in the plains of mountainous northern countries where there is not much ſnow; nay, he even thinks it might augment their hardineſs and ſtrength, if we are to judge from the habits and treatment of the Iceland flocks, ſo well deſcribed by Anderſon in his account of that iſland.

Dr Pallas remarked, that on mountainous paſtures expoſed to the ſun, ſuch as on the acclivity of the Ouralic chain, the Ruſſian or ſhort-tailed ſheep were larger, fatter, and had a finer fleece.

Croſſing the breed with the Tſcherkeſſian or long-tailed ſheep likewiſe mends both the ſtature and fleece of the brachiura; whereas, in its own natural ſtate, without admixture of other varieties of ſheep, it is but ſmall, lean, and produces, in the northern parts of Ruſſia, a wool ſo extremely coarſe as only to be fit for the cloth of peaſants in a ſtate of vaſſalage.

Whether coarſeneſs of wool and leanneſs be indeed characteriſtical marks of this ſpecies, is, we think, extremely doubtful: we are rather inclined to conſider them as mere accidental differences.

The Doctor's third variety, or *ſteatopyga*, which has a different name in almoſt every country where it is reared, is both the moſt abundant and largeſt breed of ſheep in the world. It is reared throughout all the temperate regions of Aſia, from the frontiers of Europe to thoſe of China, in the vaſt plains of Tartary. All the Nomade hordes of Aſia, the Turcomans, Kirguiſe, Calmucks, and Mongal Tartars, rear it; and indeed it conſtitutes their chief riches, the number they poſſeſs being enormous. The Perſians alſo rear it in abundance; as likewiſe the Hottentots, as we are informed by Kolbe in his Travels to the Cape of Good Hope; whilſt Oſbeck, in his Journey to China, aſſerts, that the fat-tailed ſheep are reared through that whole empire. We are alſo told by Shaw and the Abbe Demanent, that the ſame breed obtains in Syria, Mauritania, and the other regions of Africa, under ſome modifications of form, from different cauſes; ſo that Dr Pallas thinks there is ſufficient evidence that the ſteatopyga, or fat-rumped ſheep, is the moſt univerſally reared and multiplied of any breed in the world. The flocks of all the Tartar hordes reſemble one another by a large yellowiſh muzzle, the upper jaw often projecting beyond the lower; by long hanging ears; by the horns of the adult ram being large, ſpiral, wrinkled, angular, and bent in a lunar form. The body of the ram, and ſometimes of the ewe, ſwells gradually with fat towards the poſteriors; where a ſolid maſs of fat is formed on the rump, and falls over the anus in place of a tail, divided into two hemiſpheres, which take the form of the hips, with a little button of a tail in the middle, to be felt with the finger. See A fig. 16. plate CCCLXXI. The *uropygium* or fat-rump, which is made up of this oily ſpecies of fat, is ſo very large as to incommode the animal in walking; but when the ſame ſheep are carried into the interior parts of Ruſſia, the tail loſes half its ſize and weight, nay ſometimes more, from a change in their food and mode of life. This variety, beſides the characters mentioned above, have ſlender legs in proportion to their bodies, a high cheſt, large hanging teſticles, a large prepuce, and tolerably fine wool mixed with hair. Such are the great characteriſtic marks by which the flocks of all the Tartar hordes reſemble one another; but climate, ſoil, &c. produce ſome ſmall difference in this variety, whether reared by the Tartars or the Ruſſians, in the weſtern deſert of Great Tartary, from the river Volga to the Irtiſh, and the Altaic chain of mountains. In all that tract of country, the paſturage is moſtly arid; and it abounds in acrid and liliaceous plants in ſpring, whilſt in ſummer it produces, at leaſt in the open ſpots where ſheep delight to feed, beſides gramen, bitter and aromatic plants, artemiſia, camphoroſna, and many ſpecies of ſalſola, abounding in juices and ſalts. There is likewiſe found everywhere an effloreſcence of natron, with ſea or glaubers ſalt; nay, even the waters of the deſert contain in general the ſame ſalts. Now it is almoſt unneceſſary to inform European ſhepherds, that ſuch paſturage has the effect of augmenting the ſize of ſheep, if it produces no other change upon them; ſo that we ſee, in this inſtance, how ſome kind of difference may ariſe amongſt ſheep of the ſame breed merely from accidental cauſes, without the leaſt admixture of heterogeneous blood. This variety changes greatly in ſize and in other incidental circumſtances, according to the method of raiſing or of treating them in different places and by different people.

The fourth variety, raiſed by the Boucharian Tartars and Perſians in great numbers, Dr Pallas regards as a mixed breed, ariſing, as he ſuppoſes, from the union of the firſt and third varieties, *i. e.* of the long and fat-tailed ſheep. The Doctor does not think that they ever attain to the ſize of either of their parents; though, as he never ſaw any full grown, he does not ſpeak poſitively upon the ſubject. The head of this variety is like that of the Kirguiſe; but the muzzle is ſharper, reſembling the Indian of Buffon: the body is rather ſmaller than that of the Kirguiſe ſheep: the ears are large and pendant: they have a ſmall uropygium, like that of the Tartar ſheep on the Jeniſy, eſpecially when begotten by a Kirguiſe ram: but in general they have a *tail* fat and broad at the baſe, with a long narrow appendage, which reſembles the tail of the Tſcherkeſſian ſheep. The Boucharian Tartars have a very valuable traffic with the furs of the lambs of this variety, which are exquiſitely fine and beautiful. This ſame variety is likewiſe raiſed in great numbers by the Perſians; and it is more than probable, if we are to give credit to authors ancient and modern, that this very variety obtains in Syria, Paleſtine, and divers countries of Africa, known to them by the name of *ovis macrocercus*. It differs in all thoſe countries from the fat-tailed, or ſteatopyga of Pallas, in having a long tail, fat and broad above, with a long narrow appendage, which is exactly the great marked character of the Boucharian breed. Pliny tells us, that the Syrian ſheep have long fat tails, and carry wool; and by Ruſſel's account of them, in his Natural Hiſtory of Aleppo, they reſemble the Kirguiſe ſheep in the head, face, and ears hanging on the cheeks; but the tail is that of the Boucharian, fat above, with a long lean appendage. He adds, that they are covered with a ſoft wool, which is another trait of reſemblance with our preſent variety; and that they weigh ſometimes 150 pounds, one third of which is the weight of the tail. Geſner, in his work on quadrupeds, tells us, that the Arab ſheep of Kay have nearly the ſame characteriſtic marks, eſpecially with regard to the tail.

Shaw relates, in his Travels, that ſheep with ſuch a compound tail are common in Mauritania, and in all the Eaſt; whilſt Kolbe aſſures us, that the ſheep which are brought on board the ſhips at the Cape of Good Hope have tails weighing 25 or 30 pounds, fat above, with a bony appendage hanging from it; and, laſtly, the Abbé Demanent, in his New Hiſtory of Africa, ſays, that ſheep are found in Africa covered with wool, and with ſuch a tail as we have been deſcribing; whilſt at Cape Guarda, in the ſouth of Africa, all the ſheep are white, with rather ſmall black heads, otherwiſe a large handſome breed, with broad fat tails, ſix or eight inches long.

The Doctor, however, does not entirely cloſe his proofs here; for he quotes ſeveral paſſages from Moſes in confirmation of what he has advanced, *viz.* that the Boucharian ſheep obtain in Syria, Paleſtine, and divers countries of Africa. The paſſages he quotes are theſe: Leviticus viii. 25. ix. 19. But whether theſe verſes prove what the Doctor has quoted them as proving, we will not determine.

Theſe are the four varieties which Dr Pallas ſaw and examined in his extenſive travels. The account is, we think, curious; to naturaliſts intereſting; and to farmers it may be uſeful. If it only excite further reſearch, and minuter inquiry, it will anſwer ſome purpoſe. Indeed, the man of ſcience will not reſt ſatisfied with what our preſcribed bounds have permitted us to bring forward, but will recur to the original work of the learned author to whom we are primarily indebted for the above account. We refer ſuch readers, then, to his *Spicilegia Zoologica, faſciculus undecimus,* printed at Berlin in 1776.

It may not be improper to deſcribe the figures of theſe four varieties. They are all contained in Plate CCCLXXI. fig. 16. of which is the argali. Fig. 17. is a ſide and back view; letters A*a* of the ram of the ſteatopyga, or fat-rumped variety, in its greateſt purity of breed, as obtaining among the Kirguiſe Tartars in the vaſt plains of Southern Tartary. The poſition of the animal marked with *a* ſhows the uropygium or fat-rump. Letter *b* is a repreſentation of the head of the ſame animal, with a couple of noneola hanging from the neck, called by the Ruſſians *earrings.* Letter C is a drawing of another Kirguiſe ram with five horns, ſhewing at ſame time the hanging poſition of the ears of this variety. Fig. 18. is a drawing of a degenerate breed of the ſteatopyga variety of ſheep, reared on the banks of the Jeniſy and Volga, without horns, and with the uropygium or fat rump greatly diminiſhed, and one noneola. Letter *b* (fig. 19.) is a drawing of a ram of the ſame variety of ſheep, from the flocks of the Jeniſy Kirguiſe, with four horns ſymmetrically arranged by nature, as is frequently the caſe with this breed.

In a ſupplement to his article Sheep Buffon has theſe words reſpecting the ſtrepſiceros: "I here give figures," ſays the Count (ſee Plate CCCLXXI. fig. 14. and 15.) "of a ram and ewe, of which drawings were ſent me by the late Mr Colinſon, fellow of the Royal Society of London, under the names of the *Walachian ram* and *ewe.* As this learned naturaliſt died ſoon afterwards, I could not diſcover whether theſe ſheep, whoſe horns are extremely different from thoſe of the ordinary kind, be common in Walachia, or whether they are only an accidental variety (D).

See above, p. 454, &c.

"In the northern parts of Europe, as Denmark and Norway, the ſheep are not good; but, to improve the breed, rams are occaſionally imported from England. In the iſlands adjacent to Norway, the ſheep remain in the fields during the whole year; and they become larger and produce finer wool than thoſe which are under the care and direction of men. It is alleged, that thoſe ſheep which enjoy perfect liberty always ſleep, during the night, on that ſide of the iſland from whence the wind is to blow next day. This natural indication of the weather is carefully attended to by the mariners *.

"The rams, ewes, and wedders of Iceland, differ chiefly from ours by having larger and thicker horns. Some of them have three, four, and even five horns. But this peculiarity of having more horns than two, muſt not be conſidered as common to the whole race of Iceland ſheep; for in a flock of four or five hundred, hardly three or four wedders can be found with four or five horns, and theſe are ſent to Copenhagen as rarities. As a farther proof of their being ſcarce, they give a higher price in Iceland than the common kind §."

* Pontopiddan's *Nat Hiſt. of Norway.*

§ *Hiſt. Gen. des Voyages,* t. 18. p. 19.

In Spain and the ſouthern parts of Europe, the flocks of ſheep are kept in ſhades or ſtables during the night: but in Britain, where there is now no danger from wolves, they are allowed to remain without, both night and day; which makes the animals more healthy, and their fleſh a more wholeſome food. Dry and mountainous grounds, where thyme and ſheep's feſcue graſs abound, are the beſt for the paſturing ſheep.

The ſheep is ſubject to many diſeaſes: ſome ariſing from inſects which depoſit their eggs in different parts of the animal; others are cauſed by their being kept in wet paſtures; for as the ſheep requires but little drink, it is naturally fond of a dry ſoil. The dropſy, vertigo (the *pendro* of the Welſh), the phthiſis, jaundice, and worms in the liver, annually make great ha-

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(D) Dr Pallas thinks it very probable that the ſtrepſiceros variety of ſheep were produced by propagating a particular configuration of horns. He alludes to the animal which Bellonius firſt diſcovered on Mount Ida in Crete, and which he ſuppoſes the ſtrepſiceros of the ancients.

vock among our flocks: for the firſt diſeaſe, the ſhepherds finds a remedy by turning the infected into fields of broom; which plant has been alſo found to be very efficacious in the ſame diſorder among the human ſpecies.—The ſheep is alſo infeſted by different ſorts of inſects; like the horſe it has its particular œſtrus or gadfly, which depoſits its eggs above the noſe in the frontal ſinuſes (ſee Oestrus); when thoſe turn into maggots, they become exceſſively painful, and cauſe thoſe violent agitations that we ſo often ſee the animal in. The French ſhepherds make a common practice of caſing the ſheep, by trepanning and taking out the maggot; this practice is ſometimes uſed by the Engliſh ſhepherds, but not always with the ſame ſucceſs. Beſides theſe inſects, the ſheep is troubled with a kind of tick and louſe, which magpies and ſtarlings contribute to eaſe it of, by lighting on its back, and picking the inſects off.

We had intended to have introduced into this article ſome obſervations from Pennant; but it has already extended beyond its juſt limits, and we dare not venture to extend it further. Under the article Wool, which is intimately connected with the preſent, we may perhaps have an opportunity of introducing ſome additional remarks not without importance. At all events, we truſt by that time to be able to give a favourable report of that truly patriotic ſociety which has been lately inſtituted in this part of the united kingdom for meliorating the breed of ſheep, and in conſequence the nature and quality of the *wool*. From the active and indefatigable exertions of Sir John Sinclair, baronet, the preſident of that ſociety, we have every thing to hope from well conducted experiments, and nothing to fear from groundleſs hypotheſes.

OUNCE, a little weight, the 16th part of a pound avoirdupois, and the 12th part of a pound Troy. The word is derived from the Latin, *uncia*, "the twelfth part of any whole," called *as*; particularly in geometrical meaſures, an inch, or the 12th part of a foot. See Inch and As.

Ounce, in zoology. See Felis.

OVOLO, or Ovum, in architecture, a round moulding, whoſe profile or ſweep, in the Ionic and Compoſite capitals, is uſually a quadrant of a circle: whence it is alſo commonly called the *quarter-round*. It is uſually cut with repreſentations of eggs and arrow-heads or anchors placed alternately.

OU-poey tse, a name given by the Chineſe to a kind of neſts made by certain inſects upon the leaves and branches of the tree called *yen-fou-tſe*. Theſe neſts are much uſed in dyeing, and the phyſicians employ them for curing many diſtempers. Some of theſe neſts were brought to Europe, and put into the hands of the celebrated Mr Geoffroy. After having examined them with the utmoſt attention, this learned academician thought he perceived ſome conformity in them to thoſe excreſcences which grow on the leaves of the elm, and which the vulgar call *elm-bladders*: he found theſe neſts ſo ſharp and aſtringent to the taſte, that he conſidered them as far ſuperior to every other ſpecies of galls uſed by the dyers. According to him, they are the ſtrongeſt aſtringents exiſting in the vegetable kingdom.

It is certain that there is a great affinity between the ou-poey-tſe and the elm-bladders. The form of both is unequal and irregular; they are covered on the outſide with a ſhort down, which renders them ſoft to the touch; within they are full of a whitiſh-grey duſt, in which may be obſerved the dried remains of ſmall inſects, without diſcovering any aperture thro' which they might have paſſed. Theſe neſts or bladders harden as they grow old; and their ſubſtance, which appears reſinous, becomes brittle and tranſparent; however, the Chineſe do not conſider the ou-poey-tſe, notwithſtanding their reſemblance to elm-bladders, as excreſcences of the tree yen-fou tſe, upon which they are found. They are perſuaded, that inſects produce a kind of wax, and conſtruct for themſelves on the branches and leaves of this tree (the ſap of which is proper for their nouriſhment) little retreats, where they may wait for the time of their metamorphoſis, or at leaſt depoſit in ſafety their eggs, which compoſe that fine duſt with which the ou-poey-tſe are filled. Some of the ou-poey-tſe are as large as one's fiſt; but theſe are rare, and are generally produced by a worm of extraordinary ſtrength, or which has aſſociated with another, as two ſilk worms are ſometimes ſeen ſhut up in the ſame ball. The ſmalleſt ou-poey-tſe are of the ſize of a cheſnut; the greater part of them are round and oblong; but they ſeldom reſemble one another entirely in their exterior configuration. At firſt, they are of a dark green colour, which afterwards changes to yellow; and the huſk, though pretty firm, becomes then very brittle.

The Chineſe peaſants collect theſe ou-poey-tſe before the firſt hoar-froſts. They take care to kill the worm incloſed in the huſks, and to expoſe them for ſome time to the ſteam of boiling water. Without this precaution, the worm might ſoon break through its weak priſon, which would immediately burſt and be uſeleſs. The ou-poey-tſe are uſed at Pekin for giving a paper a durable and deep-black colour; in the provinces of Kiang nan and Tche-kiang, where a great deal of beautiful ſattin is made, they are employed for dyeing the ſilk before it is put on the loom. The Chineſe literati alſo blacken their beards with them when they become white.

The medicinal properties of the ou-poey-tſe are very numerous. The Chineſe phyſicians introduce them into the compoſition of many of their remedies. They recommend them for ſtopping bloodings of every kind; they conſider them as an excellent ſpecific for curing inflammations and ulcers, and for counteracting the effects of poiſon; and they employ them with ſucceſs in the dropſy, phthiſis, epilepſy, catarrhs, ſickneſs, fluxions of the eyes and ears, and in many other diſorders.

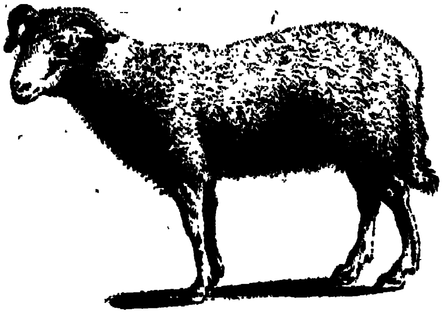
Greater OUSE, a river which riſes near Fitwell in Oxfordſhire, and proceeds to Buckingham, Stony-Stratford, and Newport-Pagnel, in Buckinghamſhire; from thence it proceeds to Bedford, and turning north-eaſt it paſſes on to Huntingdon and Ely, till at length it arrives at Lynn-Regis in Norfolk, and falls into the ſea. It is navigable to ſome diſtance above Downham, where there is a good harbour for barges; and a conſiderable trade is carried on by it to Lynn and other towns.

Smaller Ouse, riſes in Suffolk, and, ſeparating that county from Norfolk on the ſouth-weſt, diſcharges itſelf into the great Ouſe near Downham. There is ſtill another of the ſame name which riſes in the weſt-

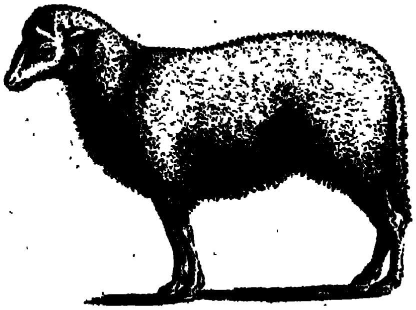
OVIS.

Plate CCCLXX.

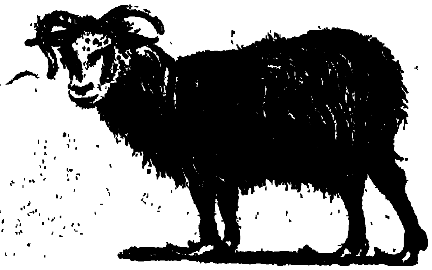
Common Ram.



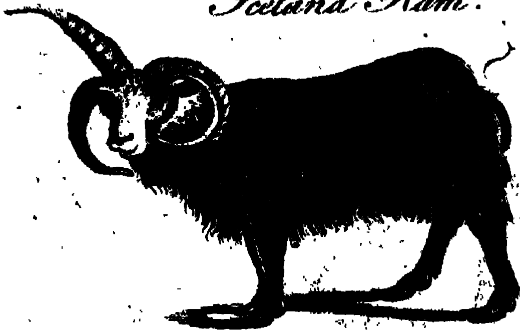
Ewe.



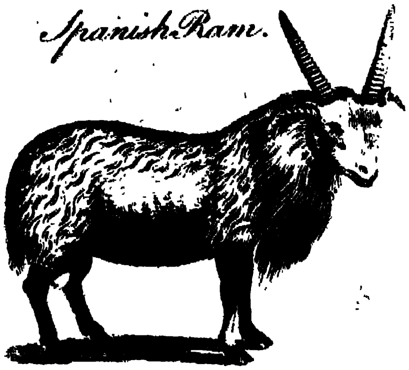
Ewe.



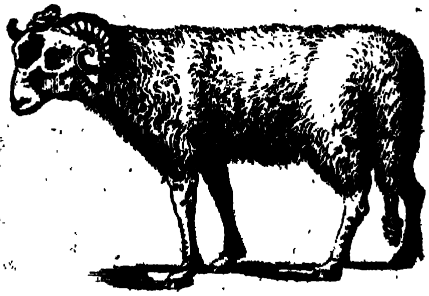
Iceland Ram.



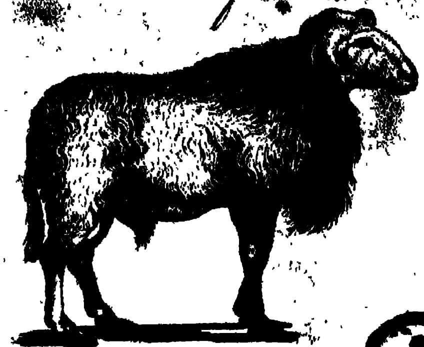
Spanish Ram.



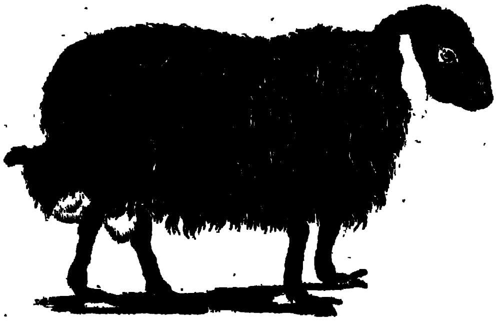
Barbary Wedder



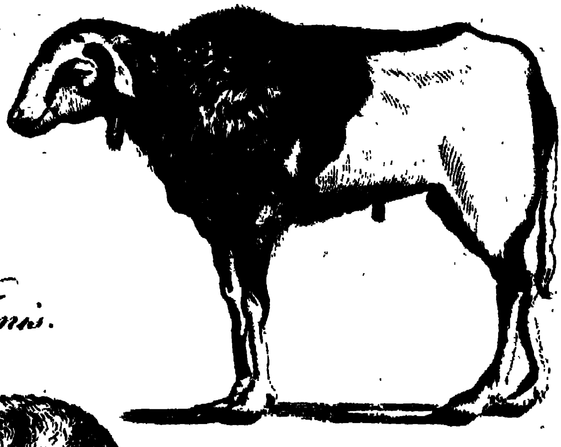
Morvant of China.



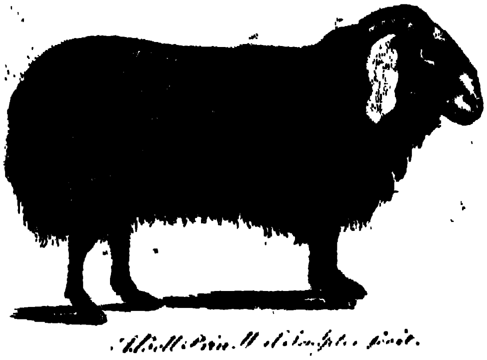
Broad tailed Sheep.



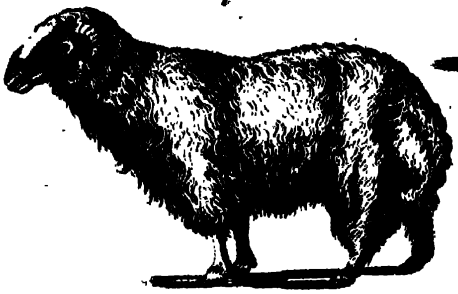
Indian Ram.



Cape Sheep.



Ram of Tunis.

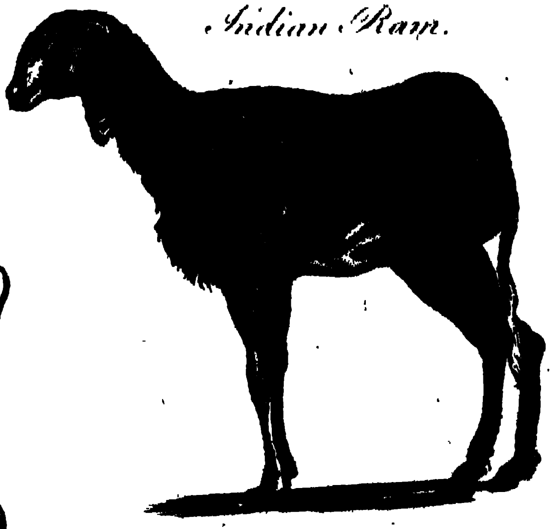


A. Bell Prin. Wal. Sculptor fecit.

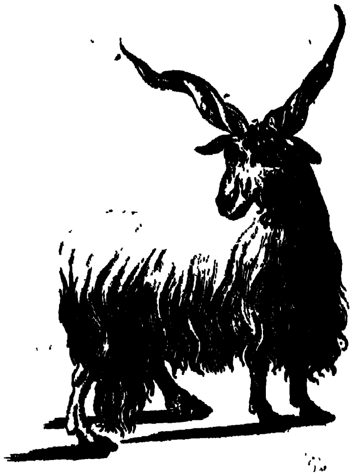
OVIS.

Plate CCCLXXI.

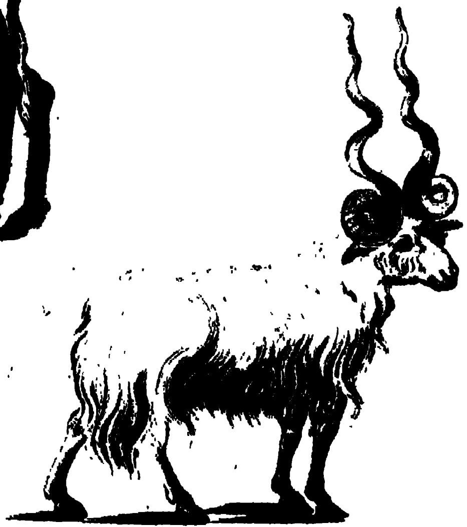
Indian Ram.



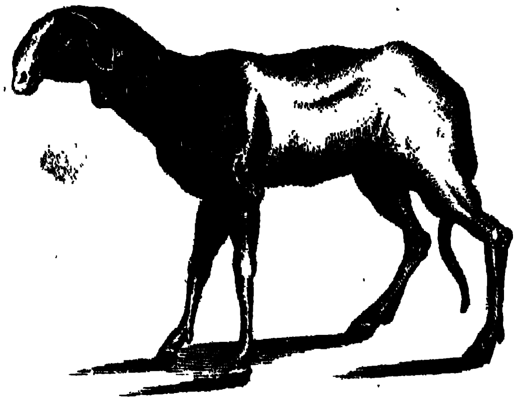
Walachian Ram.



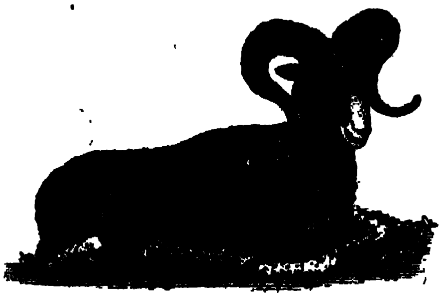
Walachian Ram.



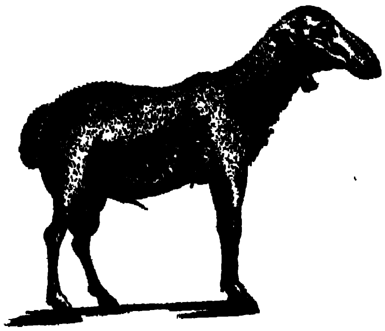
Indian Ewe



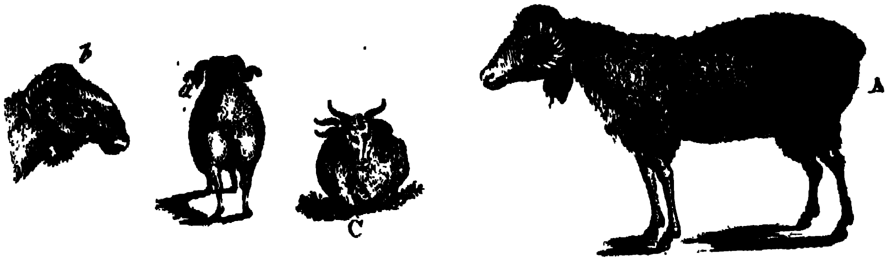
The Siberian argali,
or Wild Sheep.



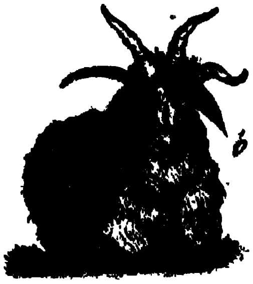
Ruſsian Sheep.



Steatopyga, Ruſsian Sheep.



Ruſsian Sheep



A. Bell. Prin. Wal. Sculptor fecit

north-weſt ſide of Yorkſhire; and chiefly running to the ſouth-eaſt, at length falls into the Humber.

OUSTER, or DISPOSSESSION, in law, an injury which carries with it the amotion of poſſeſſion; for by means of it the wrong doer gets into the actual poſſeſſion of the land or hereditament, and obliges him that hath a right to ſeek a legal remedy, in order to gain poſſeſſion, together with damages. This ouſter may either be of the freehold by abatement, intruſion, diſſeiſin, diſcontinuance, and deforcement; or of chattels real, as an eſtate by ſtatute-merchant, ſtatute-ſtaple or elegit, or an eſtate for years.

OUSTER le Main, amovere manum, in law, denotes a livery of lands out of the king's hands; or a judgment given for him that traverſed, or ſued, a *monſtrans le droit*. When it appeared, upon the matter being diſcuſſed, that the king had no right or title to the land ſeized, judgment was given in chancery, that the king's hand be amoved; and *ouſter le main*, or *amoveas manum*, was therefore awarded to the eſcheator, to reſtore the land, &c. All wardſhips, liveries, *ouſter le mains*, &c. are now taken away and diſcharged by ſtatute 12. Car. II.

OUSTIOUG, a town of the Ruſſian empire, and capital of a province of the ſame name, with an archbiſhop's ſee and a caſtle; ſeated on the river Suchan, over-againſt the mouth of the Jug, in E. Long. 43. 25. N. Lat. 61. 48.

OUSTIOUG, a province of the Ruſſian empire, bounded on the north by Dwina, on the eaſt by the foreſt of Zirani, on the ſouth by Wologda, and on the weſt by Cargapol and Waga. It is divided into two parts by the river Suchana; is full of foreſts; and the rivers yield plenty of fiſh, which the inhabitants dry in the ſun, and which make their principal nouriſhment.

OUT-POSTS, in a military ſenſe, a body of men poſted beyond the grand guard; called *out-poſts*, as being the rounds or limits of the camp.

OUTLAW, ſignifies one that is deprived of the benefit of the law, and therefore held to be out of the king's protection.

Bracton aſſerts, that an outlaw forfeits all he has; and that, from the time of his outlawry, he wears a wolf's head; and any body may kill him with impunity, eſpecially if he defend himſelf or fly. But in Edward III.'s time it was reſolved by the judges, that it ſhould not be lawful for any man, but the ſheriff alone (having ſufficient warrant for it), to put to death a man that was outlawed.

OUTLAWRY, the puniſhment of a perſon who, being called into law, and lawfully, according to the uſual forms, ſought, does contemptuouſly refuſe to appear.

The effect of being outlawed at the ſuit of another, in a civil cauſe, is the forfeiture of all the perſon's goods and chattels to the king, and the profits of his land, while the outlawry remains in force. If in treaſon or felony, all the lands and tenements which he has in fee, or for life, and all his goods and chattels, are alſo forfeited; and beſides, the law interprets his abſence as a ſufficient evidence of guilt; and without requiring farther proof, accounts the perſon guilty of the fact, on which enſues corruption of blood, &c. And then, according to Bracton, he may periſh without law, &c. However, to avoid inhumanity, no man is intitled to kill him wantonly or wilfully; but in ſo doing he is guilty of murder, unleſs it happens in endeavouring to apprehend him; for any body may arreſt an outlaw, either of his own head, or by writ or warrant of *capias utlagatum*, in order to bring him to execution.

If after outlawry, in civil caſes, the defendant publicly appear, he is to be arreſted by a writ of *capias utlagatum*, and committed till the outlawry be reverſed: which reverſal may be had by the defendant's appearing in court (and in the king's-bench, by ſending an attorney, according to ſtatute 4 and 5 W. and M. cap. 18.), and any plauſible circumſtance, however trifling, is in general ſufficient to reverſe it; it being conſidered only as a proceſs to force appearance. The defendant muſt, however, pay full coſts, and muſt put the plaintiff in the ſame condition as if he had appeared before the writ of *exigi facias* was awarded. It is appointed by magna charta, that no freeman ſhall be outlawed, but according to the law of the land. A minor or a woman cannot be outlawed.

In Scotland outlawry anciently took place in the caſe of refuſal to fulfil a civil obligation, as well as in criminal caſes. At preſent, however, it only takes place in the two caſes of flying from a criminal proſecution, and of appearing in court attended by too great a number of followers. But the defender, upon appearing at any diſtance of time and offering to ſtand trial, is intitled *de jure* to have the outlawry reverſed, and to be admitted to trial accordingly, and even to bail if the offence be bailable. See WAIVE.

OVUM ANGUINUM. See ANGUINUM.

OUTWORKS, in fortification, all thoſe works made without-ſide the ditch of a fortified place, to cover and defend it. See FORTIFICATION.

OUZEL, in ornithology; a ſpecies of MOTACILLA.

OWEN (Thomas), a judge of the common-pleas, ſon of Richard Owen, Eſq; of Condover in Shropſhire, was educated at Oxford, and, as is generally ſuppoſed, at Chriſt-church college. Having taken a degree in arts, he left the univerſity, and entered himſelf of Lincoln's inn in London, where in proceſs of time he became an eminent counſellor. In 1583 he was elected Lent reader to that ſociety. In 1590 he was made ſerjeant at law, and queen's ſerjeant ſoon after. He arrived at length at the dignity of judge of the common pleas; which office he is ſaid to have executed, during five years, with great abilities and integrity. He died in 1598; and was buried on the ſouth ſide of the choir in Weſtminſter abbey, where a monument was erected to his memory. He had the reputation of a learned man, and a patron of literature. He was the author of "Reports in the common pleas, wherein are many choice caſes, moſt of them thoroughly argued by the learned ſerjeants, and after argued and reſolved by the grave judges of thoſe times, with many caſes wherein the difference of the year-books are reconciled and explained." Lond. 1656, folio.

OWEN (Dr John), an eminent and learned diſſenting miniſter, was born in 1616, at Hadham, in Oxfordſhire, of which place his father was vicar. He made ſuch ſurpriſing proficiency in learning, that at twelve years of age he was admitted into Queen's-college, Oxford, and in 1635 was made maſter of arts: but ſoon after, diſapproving the new regulations made by Archbiſhop Laud their chancellor, with which he

Owen.

refuſed to comply, he was obliged, in 1637, to leave the univerſity; when, taking orders, he became chaplain to Sir Robert Dormer of Aſcot in Oxfordſhire, and was at the ſame time tutor to his eldeſt ſon. He was afterwards chaplain to John Lord Lovelace of Hurley in Berkſhire; when the civil war broke out, he openly avowed the cauſe of the parliament; which was ſo reſented by an uncle, who had intended to leave him his eſtate, that he diſcarded him, and left it to another. Yet though Lord Lovelace ſided with the king, he treated his chaplain with great civility: but on his going to join the royal army, Mr Owen went to London, and ſoon after joined the non-conformiſts. In 1642 he publiſhed his book, intitled, *A Diſplay of Arminianiſm*, which laid the foundation of his future advancement: for the committee for purging the church of ſcandalous miniſters were ſo pleaſed with it, that Mr White their chairman ſent him a preſentation of the living of Fordham in Eſſex: but when he had been there about a year and a half, the patron hearing that the ſequeſtered incumbent was dead, preſented another to the living; upon which the Earl of Warwick gave Mr Owen the living of Coggeſhal. He had not, however, been long at that town before he left the Preſbyterians; and, joining the Independents, formed a church there. He was now ſent for ſeveral times to preach before the parliament; and among the reſt on the 28th of February 1648-9, the day of humiliation for the intended expedition to Ireland. Cromwell, who was preſent at this laſt diſcourſe, and had never heard him before, was extremely pleaſed with it, and deſired his company into Ireland, and that he would reſide in the college of Dublin. This he did; but returned in about half a year. Soon after Cromwell ſent him into Scotland; but he alſo returned from thence after about half a year's ſtay at Edinburgh. He was then promoted to the deanery of Chriſt-church, Oxford, whither he went in 1651; and Cromwell, being now chancellor of the univerſity, nominated him his vice-chancellor. The next year he was created doctor of divinity by diploma. Dr Owen enjoyed the poſt of vice chancellor five years; during which he behaved with the greateſt moderation; for, though often ſolicited, he never moleſted the meeting of the royaliſts at the houſe of Dr Willis the phyſician, where divine ſervice was performed according to the liturgy of the church of England: and though he was a commiſſioner for ejecting ſcandalous miniſters, he frequently overruled his brethren in favour of thoſe royaliſts who were diſtinguiſhed by their merit. At the death of Cromwell, he was removed from the vice-chancellorſhip; and at the Reſtoration was ejected from his deanery of Chriſt-church. But he had provided himſelf a comfortable retreat at an eſtate he had purchaſed at Hadham. He now employed himſelf in preaching as often as he had an opportunity, and in writing books; one of which, intitled *Fiat Lux*, falling into the hands of Lord Clarendon, he was ſo pleaſed with it, or (as is ſaid) from policy pretended to be ſo, that he ſent for Dr Owen, and acknowledging the ſervice he had done by it to the Proteſtant religion, offered to prefer him in the church if he would conform; but he deſired to be excuſed.—His moderation drew him reſpect from perſons of oppoſite principles; and in the number of his friends were Dr Wilkins biſhop of Cheſter, and Dr Barlow biſhop of London. He died at Ealing in 1683. His works are printed in ſeven volumes folio.

Wood, after cenſuring him in many reſpects, ſays neverthelefs, that, "to ſpeak impartially, he was a perſon well ſkilled in the tongues, Rabbinical learning, and Jewiſh rites and cuſtoms; that he had a great command of his Engliſh pen, and was one of the genteeleſt and faireſt writers who have appeared againſt the church of England."

Owhyhee.

OWHYHEE, the eaſternmoſt, and by far the largeſt, of the Sandwich Iſlands. Its greateſt length from north to ſouth is 28½ leagues, its breadth 24, and its circumference nearly 300 Engliſh miles. It is divided into ſix large diſtricts; two of which on the north-eaſt ſide are ſeparated by a mountain, that riſes in three peaks, which is perpetually covered with ſnow, and may be ſeen clearly at 40 leagues diſtance. To the north of this mountain, the coaſt conſiſts of high and ſteep cliffs, down which fall many beautiful caſcades of water. The whole country is covered with cocoa-nut and bread-fruit trees. The peaks of the mountain on the north eaſt ſide appear to be about half a mile in height, and entirely covered with ſnow. To the ſouth of this mountain, the coaſt preſents a proſpect of the moſt dreary kind, the whole country appearing to have undergone a total change by means of ſome dreadful convulſion. The ground is everywhere covered with cinders, and interſected in many places with black ſtreaks, which ſeem to mark the courſe of a lava that has flowed not many ages ſince from the mountain to the ſhore. The ſouthern promontory looks like the mere dregs of a volcano. The projecting headland is compoſed of broken and craggy rocks, piled irregularly one upon another, and terminating in ſharp points; yet amidſt theſe ruins, there are many pieces of rich ſoil, which are carefully out in plantations, and the neighbouring ſea affords a vaſt variety of excellent fiſh: ſo that this quarter is much better inhabited than thoſe which are more verdant. The fields are incloſed with ſtone fences, and are interſperſed with groves of cocoa nut trees. We are told indeed by ſome of Cook's people who [illegible] through a conſiderable part of it, that they did [illegible] obſerve a ſpot of ground that was ſuſceptible of improvement left unplanted; and indeed the country, from their account, could ſcarcely be cultivated [illegible] greater advantage for the purpoſes of the natives. They were ſurpriſed at ſeeing ſeveral fields of hay; and upon their inquiry, to what particular uſe it was applied, they were informed, that it was intended to cover the grounds where the young *taro* grew, in order to preſerve them from being ſcorched by the rays of the ſun. They obſerved among the plantations a few huts ſcattered about, which afforded occaſional ſhelter to the labourers; but they did not ſee any villages at a greater diſtance from the ſea than four or five miles. Near one of them, which was ſituated about four miles from the bay, they diſcovered a cave forty fathoms in length, three in breadth, and of the ſame height. It was open at each end; its ſides were fluted as if wrought with a chiſel; and the ſurface was glazed over, perhaps by the action of fire. There are ſuppoſed to be on this iſland about 150,000 inhabitants. So long as the name of Captain Cook ſhall be remembered, this iſland will not be forgotten; for he here fell a victim to a ſtrange concatenation of events. See Cook.

We have the following account of the inhabitants of this iſland in Ellis's Authentic Narrative, &c. "The men are above the middle ſize, ſtout, well made, and fleſhy, but not fat. Corpulency is not altogether ſo great a mark of diſtinction in theſe as in the Society Iſles; and tallneſs, for which the Otaheiteans have great partiality, is alſo overlooked. Their colour is in general brown olive. The women are in general maſculine, though there are ſome delicately made, and the voice of them all is ſoft and feminine. The hair both of the head and beard is black; that of the head the men wear in the form of a helmet, that is, a long frizzled ridge from the forehead to the neck, the ſides being much ſhorter. This faſhion ſeems to prevail only among the principal people, that of the inferior ſort being of an equal length in every part. Moſt of them were very deſirous of parting with their beards, which, they ſaid, were diſagreeable and troubleſome, and were fond of being ſhaved by our people. Some of the prieſts wore their beards long, and would not on any account part with them. The women wear their hair long before, but very ſhort behind, which is not the moſt becoming mode; and, like thoſe of the Friendly Iſles, they have a way of rendering it of different colours, red, yellow, and brown. The features of both ſexes are good, and we ſaw ſome of the females who might really be called fine women. Their teeth are even and perfectly white. In general, they ſeem to be very healthy, and we obſerved ſeveral who appeared to be of great age. As to diſeaſes, we ſaw none who laboured under any during our ſtay except the venereal complaint; coughs and colds indeed were pretty general, and one man died. From what we could learn of his diſorder from the natives, it was a violent griping or colic.

"Both men and women appeared to be of a good diſpoſition, and behaved to each other with the tendereſt regard: when they did fall out, which ſometimes was the caſe, occaſioned by the upſetting of a canoe, or ſome ſuch trifling accident, they only ſcolded a little, and this was ſoon over and forgotten. We never ſaw them ſtrike each other upon any occaſion. They are all thieves, from the aree to the towtow, but not quite ſo expert at it as our Otaheitee friends.

"The cuſtom of tattowing prevails greatly among theſe people, but the men have a much larger ſhare of it than the women; many (particularly ſome of the natives of Mow'whee) have one half their body, from head to foot, marked in this manner, which gives them a moſt ſtriking appearance. It is done with great regularity, and looks remarkably neat: ſome have only an arm marked in this manner, others a leg; ſome again have both arm and leg, and others only the hand. The women are the moſt part marked upon the hand, and ſome upon the tip of their tongue; but of theſe we ſaw but few. Both ſexes have a particular mark according to the diſtrict in which they live; or it is rather the mark of the aree, or principal man, under whoſe juriſdiction they more immediately are. We never ſaw the operation of tattowing performed, nor could we procure a ſight of the inſtruments uſed upon this occaſion; but it is likely they are much the ſame as thoſe of the Friendly and Society Iſles.

"Both men and women are very cleanly in their perſons; the latter waſh their whole bodies in freſh water twice and ſometimes three times a-day; but the women of Otaheitee have the advantage of them in one point of cleanlineſs, which is eradicating the hairs from under the arm pits. This is a cuſtom we obſerved nowhere but at the Society Iſles.

"There are no people in the world who indulge themſelves more in their ſenſual appetite than theſe: in fact, they carry it to a moſt ſcandalous and ſhameful degree, and in a manner not proper to be mentioned. The ladies are very laviſh of their favours; but are far from being ſo mercenary as thoſe of the Friendly or Society Iſles, and ſome of their attachments ſeemed purely the effect of affection. They are initiated into this way of life at a very early period; we ſaw ſome who could not be more than ten years old.

"Their clothing conſiſts of cloth of different kinds: that worn by the men, which is called *marro*, is about half a yard wide, and four yards long; that of the women three quarters of a yard wide, and of the ſame length as the mens: this they call *pah-oouwa*; they both wear it round their middle, but the men paſs it between their legs. This is the general dreſs of both ſexes; but the better ſort ſometimes throw a large piece looſely over their ſhoulders. Beſides the marro, they have ſeveral other kinds of cloth, which derive their names either from the different uſes they are applied to, or their different texture and pattern; all, however, as far as we could learn, are made from the Chineſe paper mulberry tree. The principal of theſe is the cappa, which is about 10 or 12 feet long, and nearly as many wide, and is thick and warm; they wrap themſelves up in this when they retire to ſleep. They have another kind, which is white, and much thinner; this, as has been before obſerved, they throw looſely over their ſhoulders; it is ſometimes 20 or 30 yards long, and wide in proportion. The marro and pah o'ouwa are curiouſly painted of various patterns, but the others are generally white, or dyed red, black, and yellow.

"The principal ornaments of the men are the feather-caps and cloaks; ſome of the latter reach down to their heels, and have a moſt magnificent appearance. They are made for the moſt part of red and yellow feathers, which are tied upon fine net-work. The caps are compoſed of the ſame kind of feathers, which are ſometimes intermixed with black; they are ſecured upon a kind of baſket-work, made in the form of a helmet. Both caps and cloaks are made of various patterns and ſizes. The cloaks are not all compoſed of the ſame kind of feathers, but are ſometimes varied with the long tail-feathers of the cock, with a border of yellow or red, and ſometimes with thoſe of the tropic bird. Both caps and cloaks, however, are only to be ſeen in the poſſeſſion of the principal people. They have alſo a kind of fly-flap, made of a bunch of feathers fixed to the end of a thin piece of ſmooth and poliſhed wood: they are generally made of the tail-feathers of the cock, but the better ſort of people have them of the tropic birds feathers, or thoſe belonging

ing to a black and yellow bird called *mohó*. The handle is very frequently made of one of the bones of the arm or leg of thoſe whom they have killed in battle, curiouſly inlaid with tortoiſe-ſhell: theſe they deem very valuable, and will not part with them under a great price. This ornament is common to the ſuperiors of both ſexes.

"The women too have their ſhare in the ornamental way: that which they value moſt is the orài. This is a kind of ruff or necklace, made of red, green, black, and yellow feathers, curiouſly put together, and in moſt elegant patterns, which really do honour to the fancy of the ladies, whoſe buſineſs it is to make them. They never think themſelves dreſſed without one or two of theſe round their necks, and thoſe who can afford it wear many. Others again are compoſed of ſmall variegated ſhells, diſpoſed in a very neat manner; and ſome conſiſt of ſeveral rows of twiſted hair, with a piece of carved wood or bone, highly poliſhed, the bottom part forming a curve. The higher the quality of the wearer, the greater is the ſize of the wood or bone, and the quantity of the twiſted hair. The next thing is the poo-remah or bracelet; the moſt valuable are made of boar's tuſks faſtened together ſide by ſide with a piece of ſtring, by means of a hole drilled through the middle; the larger the tuſks, the greater the value. Sometimes two ſhells tied round the wriſts with twiſted or braided hair, ſerve the purpoſe of bracelets; but even in this caſe they ſhow great nicety, being particularly careful to match them as near as poſſible. They were prodigiouſly fond of thoſe we gave them, which were only a few beads, ſecured by thread upon a ſtrip of ſcarlet cloth, and made to button round the wriſt. So much did they at firſt value them, that a ſmall hatchet and one of theſe would purchaſe a hog, which without it could not have been bought for three large hatchets. The women were perpetually teazing the men to diſpoſe of their various articles for theſe bracelets; at leaſt one of them was always to make a part of the price." W. Long. 156. 0. S. Lat. 19. 28.

OWL, in ornithology. See Trix.

OWLING, ſo called from its being uſually carried on in the night, is the offence of tranſporting wool or ſheep out of this kingdom, to the detriment of its ſtaple manufacture. This was forbidden at common law, and more particularly by ſtatute 11 Edw. III. c. 1. when the importance of our woollen manufacture was firſt attended to; and there are now many later ſtatutes relating to this offence, the moſt uſeful and principal of which are thoſe enacted in the reign of Queen Elizabeth, and ſince. The ſtatute 8 Eliz. c. 3. makes the tranſportation of live ſheep, or embarking them on board any ſhip, for the firſt offence forfeiture of goods, and impriſonment for a year, and that at the end of the year the left hand ſhall be cut off in ſome public market, and ſhall be there nailed up in the openeſt place; and the ſecond offence is felony. The ſtatutes 12 Car. II. c. 32. and 7 & 8 Will. III. c. 28. make the exportation of wool, ſheep, or fuller's earth, liable to pecuniary penalties, and the forfeiture of the intereſt of the ſhip and cargo by the owners, if privy; and confiſcation of goods, and three years impriſonment to the maſter and all the mariners. And the ſtatute 4 Geo. I. c. 11. (amended and farther enforced by 12 Geo. II. c. 21. and 19 Geo. II. c. 34.), makes it tranſportation for ſeven years, if the penalties be not paid.

OXALIS, woodsorrel: A genus of the pentagynia order, belonging to the decandria claſs of plants; and in the natural method ranking under the 14th order, *Gruinales*. The calyx is pentaphyllous; the petals connected at the heels; the capſule pentagonal, and opening at the angles. There are ſeven ſpecies; of which the only remarkable is the acetoſella, or common woodſorrel. This grows naturally in moiſt ſhady woods, and at the ſides of hedges in many parts of Britain, and is but ſeldom admitted into gardens. The roots are compoſed of many ſcaly joints, which propagate in great plenty. The leaves ariſe immediately from the roots upon ſingle long foot-ſtalks, and are compoſed of three heart-ſhaped lobes. They are gratefully acid, and of uſe in the ſcurvy and other putrid diſorders.

OXFORD, the capital of a county of the ſame name in England, celebrated for its univerſity, and pleaſantly ſituated in a plain, with a fine fruitful country all around. The compoſition of the name is obvious. In the British times it ſeems to have been a place of ſtudy. "The wiſdom of our anceſtors (ſays Camden) as appears in our hiſtory, conſecrated even in the Britiſh times this city to the muſes, tranſlating them from Greeklade (now a ſmall town in Wilts) hither, as to a more fruitful nurſery. For Alexander Necham* writes, 'Italy claims ſuperior knowledge of civil law; but the ſtudy of divinity and the liberal arts prove, that the univerſity of Paris deſerves the preference to all others. Agreeable alſo to Merlin's prophecy, Wiſdom has flouriſhed at the Ford of Oxen, and will in its due time paſs over alſo into Ireland.' But in the following Saxon age, when ſo many critics were deſtroyed, it underwent the common fate, and for a long while was famous only for the relicks of Frideſwide, who was ranked among the ſaints for her holy life, merely becauſe ſhe had ſolemnly devoted herſelf to God; and Prince Algar, ſoliciting her in marriage, was miraculouſly, as they ſay, deprived of his eyeſight."

Perhaps the following additional extract from Camden will be more to the purpoſe in developing the ancient ſtate of learning in this city, than any thing which we could bring forward of our own. "When the ſtorm of the Daniſh war was over, the moſt religious prince Alfred* reſtored their retreats to the long-exiled muſes, by founding three colleges, one for grammarians, another for philoſophy, and a third for divinity. This will be more fully explained by the following paſſage in the old annals of the New Monaſtery at Wincheſter. 'In the year of our Lord 806, the ſecond year of the arrival of St Grimbald in England, the univerſity of Oxford was begun; the firſt who preſided and read divinity lectures in it being St Neoth, an abbot and able divine, and St Grimbald, a moſt eminent profeſſor of the incomparable ſweetneſs of the ſacred pages; Aſſer the monk, an excellent ſcholar, profeſſing grammar and rhetoric; John monk of the church of St David giving lectures in logic, muſic, and arithmetic; and John the monk, colleague of St Grimbald, a man of great parts, and a univerſal ſcholar, teaching geometry and aſtronomy before the moſt glorious and invincible King Alfred, whoſe memory will dwell like honey in the mouths of all." Soon after, as we find in an excellent MS. of the ſaid Aſſer, who was at that time profeſſor here, 'broke out a ſharp and fatal quarrel between Grymbold and thoſe very learned men whom he had brought thither with him, and the old ſcholars whom he found there; who, on his coming, unanimouſly refuſed to receive the rules, methods, and forms of lecturing, that Grymbold introduced. Three years had paſſed without any great difference between them; but the ſecret averſion afterwards broke out with the utmoſt violence. In order to quell it, the invincible King Alfred, as ſoon as he heard of it by the meſſages and complaints from Grymbold, went in perſon to Oxford to put an end to the diſpute, and he took the greateſt pains to hear the cauſes and complaints on both ſides. The foundation of the difference was this: The old ſcholars maintained, that before Grymbold came to Oxford, learning had flouriſhed there, though the ſcholars at that time were fewer than in more ancient times, the greater part being driven out by the cruelty and oppreſſion of the Pagans. They alſo proved and ſhowed, and that by the undoubted teſtimony of ancient chronicles, that the ordinances and regulations of the place were eſtabliſhed by certain religious and learned men, ſuch as Gildas, Melkinus, Ninnius, Kentigern, and others, who had all lived to a good old age in theſe ſtudies, having ſettled matters there in peace and harmony; and alſo that St Germanus came to Oxford, and ſtaid there half a year in his journey over Britain to preach againſt the Pelagian hereſies, and wonderfully approved their plan and inſtitution. The king, with unheard-of condeſcenſion, gave both parties attentive hearing, and repeated his pious and ſeaſonable advice to maintain mutual union and concord, and left them with the proſpect that both parties would follow his advice and embrace his inſtitutions. But Grymbold, offended at this proceeding, immediately retired to the monaſtery at Wincheſter lately founded by King Alfred. He alſo cauſed his tomb to be removed to Wincheſter, in which he had intended to lay his bones when his courſe of life was ended, in the vault under the chancel of St Peter's church at Oxford, which church himſelf had built from the ground of ſtone poliſhed in the moſt coſtly manner.'

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* *De Natura Rerum*, lib. 2.

* A.D. 886.

"This happy reſtoration of learning was followed in a few years by various calamities. The Danes in the reign of Edward plundered and burnt the place; and ſoon after Harold Harefoot practiſed the moſt inhuman barbarities here in revenge for ſome of his men who were killed in an affray; ſo that the moſt melancholy remove of the ſtudents enſued, and the univerſity remained almoſt extinct, a lamentable ſpectacle till the time of William the Norman. Some have falſely ſuppoſed this prince took the city, miſled by a wrong reading in ſome copies of *Oxonia* for *Exonia*. At that time, however, it was the ſeat of an univerſity, as we learn from theſe words of Ingulphus, who lived at that time. 'I Ingulphus ſettled firſt at Weſtminſter, was afterwards ſent to ſtudy at Oxford, having made greater proficiency than many of my own age in Ariſtotle, &c.' 'What we call an *univerſity*, they in that age called a *ſtudy*." Many are of opinion that it was deſerted till about the year 1129, and that this deſertion was in conſequence of its having been beſieged and taken by William the Conqueror. About this year, however, Robert Pulen began to read lectures in divinity, or (as it is expreſſed in the chronicle of Oſeney abbey) the Holy Scriptures, which had fallen into neglect in England; and ſuch was the reſort of ſtudents to it, that in the reign of King John there were not fewer than 3000. Robert d'Oily, a Norman, to whom William the Conqueror had given the greateſt part of it, built a caſtle on the weſt ſide in 1071; and he is alſo ſuppoſed to have ſurrounded it with walls. In a palace built by Henry I. was born Richard I. commonly called *Cœur de Lion*. About the tenth of King John, there happened a quarrel between the citizens and ſtudents; in conſequence of which many of the latter quitted it, but returned again a few years afterwards. Here Henry III. held a parliament to ſettle the differences betwixt him and his barons; when he confirmed the privileges granted to the univerſity by his predeceſſors, and added others of his own. In this reign the ſtudents are ſaid to have been 30,000, who were all excommunicated by the pope for ſome rudeneſs to his legate. In the time of Duns Scotus, we are told that 30,000 ſcholars attended his lectures. Matthew Paris ſtyles the univerſity of Oxford, 'the ſecond ſchool of the church after Paris, and the very foundation of the church.' The popes had before this honoured it with the title of *Univerſity*, which they had conferred by their decrees on no other but that of Paris, this of Oxford, and thoſe of Bologna and Salamanca. It was decreed in the council of Vienne, that 'ſchools for the ſtudy of the Hebrew, Arabic, and Chaldee languages, ſhould be erected in the ſtudies of Paris, Oxford, Bologna, and Salamanca (as the moſt conſiderable), that the knowledge of theſe languages might prevail by their being thus taught; and that Catholic perſons be choſen, ſufficiently verſed therein, two in each language. For thoſe in Oxford, the biſhops, monaſteries, chapters, convents, colleges, exempt and not exempt; and the rectors of churches throughout England, Scotland, Ireland, and Wales, were to provide a competent maintenance." In Edw. III.'s time, the ſcholars were ſplit into two factions, called the *northern* and *ſouthern men;* a diviſion which was attended with many diſorders and much violence, but in a ſhort time concord and harmony again prevailed.

As colleges began about this time to be founded and endowed, we ſhall here preſent our readers with a liſt of them, together with the time when, and the perſons by whom, they were founded.

College.	*Founders.*	*Kings reigns.*
Univerſity.	King Alfred.	Alfred.
Baliol.	Sir John Baliol, father to the king of Scots	Henry III.
Merton.	Walter Merton, lord chancellor and biſhop of Rocheſter.	Edward I.
Oriel.	Edward II.	Edw II.
Exeter	Walter Stapleton, biſhop	Edw. II.
Queens.	Robert Eglesfield, B D.	Edw III.
New College.	William of Wickham, biſhop of Wincheſter, lord chancellor.	Edw III.
Lincoln.	Richard Fleming, biſhop of Lincoln.	Henry VI.
All-Souls.	Hugh Chicheley, archbiſhop of Canterbury.	Henry VI.
Magdalen.	William Wainfleet, biſhop of Wincheſter, lord chancellor.	Henry VI.
Brazen-Noſe.	William Smith, biſhop of Lincoln, and Richard Sutton, Eſq;	Hen VIII.

Colleges.	*Founders.*	*Kings reigns*
Corpus-Chriſti	Richard Fox, biſhop of Wincheſter, and lord privy ſeal.	Hen. VIII.
Chriſt-Church.	Henry VIII and Cardinal Wolſey	Hen. VIII.
Trinity	Sir Thomas Pope.	Mary
St John Baptiſt.	Sir Thomas White, merchant of London	Mary.
Jeſus	Queen Elizabeth	Elizabeth.
Wadham.	Nicolas and Dorothy Wadham.	James I
Pembroke.	Thomas Tiſdale, Eſq; and Dr Richard Whitwick.	James I.

Worceſter was called *Glouceſter-hall* till lately, that it was endowed by Sir Thomas Coke, and made collegiate.

Hartford was *Hart hall* till 1740, that it was erected into a college by Dr Richard Newton

All theſe are richly endowed, and have fine gardens, libraries, chapels, &c. The halls in which the ſtudents maintain themſelves, except a few that have exhibitions, are theſe: St Edmund's, belonging to Queen's college; Magdalen, to Magdalen college; St Alban's, to Merton; St Mary's, to Oriel; New-Inn, to New-college. Several perſons have been great benefactors to particular colleges, as Dr Ratcliffe to Univerſity college; Colonel Codrington and Dr Clarke, to All-Souls; Queen Caroline, to Queen's; the before-mentioned Dr Clarke and Mrs Eaton, to Worceſter; Dr Wake, archbiſhop of Canterbury, to Chriſt-church. The moſt conſiderable of theſe colleges are Magdalen's and Chriſt-church, which are as noble foundations as any in the world. The church of the latter is the cathedral, and has a dean, eight canons, eight chaplains, eight ſinging men, eight choriſters, a teacher of muſic, and an organiſt. Each of the colleges has its viſitor appointed by its ſtatutes, except Chriſt-church, which is ſubject to the viſitation of the Sovereign alone. The other remarkable buildings belonging to the univerſity are, firſt, the public ſchools; ſecondly, the Bodleian or public library; thirdly, Ratcliffe's library, a moſt elegant ſtructure, for building and furniſhing which, Dr Ratcliffe left 40,000l; fourthly, the theatre, built by Sheldon, archbiſhop of Canterbury; fifthly, the muſeum, in which is an elaboratory and a repoſitory for natural and artificial rarities and antiquities; ſixthly, the Clarendon printing-houſe, ſo called, becauſe it was built partly with the money ariſing to the univerſity by the ſale of Lord Clarendon's hiſtory. To the ſouth of Magdalen college lies the phyſic garden, inſtituted by the Earl of Danby, and much improved by Dr Sherrard. It contains five acres, in which is a complete ſeries of ſuch plants as grow naturally, diſpoſed in their reſpective claſſes; together with two neat and convenient green-houſes, ſtocked with a valuable collection of exotics, and a hot-houſe, where various plants brought from the warmer climates are raiſed. The whole body of the univeſity, including profeſſors, fellows, and ſtudents of all ſorts, exceeds 3000. Each college has its particular ſtatutes and rules for government. There are four terms in the year for public exerciſes, &c. and particular days and hours for public lectures by the ſeveral profeſſors. The univerſity is governed by a chancellor, high-ſteward, vice chancellor, two proctors, a public orator (ſee *Public* Orator); a keeper of the archives, a regiſter, three eſquire beadles, and three yeomen-beadles. As to the city, it has had the ſame privileges granted to it as London, particularly an exemption from toll all over England. It was made an epiſcopal ſee in 1541, when Robert King, the laſt abbot of Oſeney, was elected Biſhop. It is governed by a mayor, high-ſteward, recorder, four aldermen, eight aſſiſtants, two bailiffs, a town-clerk, two chamberlains, all that have borne the office of bailiff and chamberlain, and twenty-four common-council men; but theſe are ſubject to the chancellor or vice-chancellor of the univerſity in all affairs of moment; and not only the mayor, but the principal citizens, and ſheriff of the county, take an oath to maintain the privileges of the univerſity. The city, including the colleges, is a place of conſiderable magnitude, having 13 pariſh-churches, beſides the cathedral, well built, clean, and regular. At the entrance of the town from the Woodſtock and Banbury roads, a neat hoſpital hath been lately erected by the truſtees of Dr Ratcliffe's benefaction, out of the ſurplus money remaining after defraying the expence of his library. The male line of the family of Vere, to whom the city had given the title of earl for 500 years, failing in Aubrey de Vere, who was twentieth earl, Queen Anne conferred the title upon Robert Harley, a deſcendant of the Veres, in whoſe family it ſtill continues. The chief trade of the city is in malt, conveyed in barges to London. It is impoſſible, in the narrow bounds neceſſarily preſcribed to this article, to give ſo particular an account of this celebrated place as its importance demands: but we ſhall refer our readers to the article University, when this ſeminary, amongſt others, ſhall be more particularly deſcribed.

OXFORDSHIRE, which made part of the territory of the ancient *Dobuni*, a county of England, bounded on the weſt by Glouceſterſhire; on the ſouth, where it is broadeſt, the river Iſis divides it from Berkſhire; on the eaſt, it is bounded by Buckinghamſhire; and on the north, where it terminates in a narrow point, it has on the one ſide Northamptonſhire, and on the other Warwickſhire. It extends 50 miles from north to ſouth, and 35 from eaſt to weſt, making about 130 in circumference: within which are contained one city, 15 market towns, 280 pariſhes, 14 hundreds, 534,000 acres, and about 120,000 ſouls. The air is ſweet and pleaſant, and the ſoil rich and fertile. The lower parts conſiſt of meadows and corn-fields, and the higher were covered with woods till the civil wars; in which they were ſo entirely deſtroyed, that wood is now extremely ſcarce and dear, except in what is called the chiltern, and ſo is coal; of conſequence fuel bears an exorbitant price. The county is extremely well watered; for beſides the Iſis, Tame, Cherwell, Evenlode, and Windruſh, there is a great number of leſſer rivers and brooks. One of the four great Roman ways paſſes quite thro' this county, entering at the pariſh of Chinner, and going out at that of Goring. There is another leſſer one, that extends between Colnbrook and Wallinford, called *Gremeſdike.* The county ſends nine members to parliament, viz. two for the ſhire, two for the city, two for the univerſity, two for new Woodſtock, and one for Banbury.

OXGANG, or Oxgate, is generally taken, in our old law-books, for 15 acres, or as much ground as a ſingle ox can plough in a year.

OXUCLÆ, in natural hiſtory, the name of a genus of foſſils of the claſs of ſelenitæ, but of the columnar, not the rhomboidal, kind. Of this genus there are only two known ſpecies: 1. A fine kind with thin flakes and tranſverſe filaments, found in the clayey banks of the river Nen, near Peterborough in Northamptonſhire; and, 2. A dull kind with thick plates and longitudinal filaments. This is not uncommon in Yorkſhire, and lies ſometimes in a yellow and ſometimes in a blue clay.

OXUS, or Jihun, a large river of Aſia, much taken notice of in ancient hiſtories, but does not riſe in the north of India, as moſt writers affirm; for, according to the beſt and lateſt maps made by thoſe who have been upon the ſpot, it ran a courſe of about 260 miles from the Caſpian ſea to the lake Aral, whoſe dimenſions have lately been diſcovered, and is but very lately known to the Europeans; but, as it paſſes through a deſart country abounding with ſands, the inhabitants ſo diverted its courſe, that the old channel can hardly be diſcovered.

OXYCRATE, in pharmacy, a mixture of vinegar and water, proper to aſſuage, cool, and refreſh. The uſual proportion is one ſpoonful of vinegar to five or ſix ſpoonfuls of water.

OXYD, is the term uſed in the new chemical nomenclature to expreſs a very numerous claſs of bodies formed by the union of certain baſes with a ſmaller proportion of oxygene than what is neceſſary for their converſion into acids. (See Oxygene). The moſt remarkable of theſe bodies are what were formerly called metallic calces, and have for their baſe ſome metallic ſubſtance. It is in this ſtate that metals are contained in their ores, from which they are extracted, and converted into the reguline or metallic form, by the proceſs called *reduction*. Metals are converted into oxyds by combuſtion, and by ſolution in acids; and many of them aſſume this form from the action of the atmoſphere alone, but more readily when this is aſſiſted by moiſture. During their converſion into oxyds, metals loſe their ſplendor, and, acquiring a conſiderable increaſe of abſolute weight, put on an earthy, pulverulent appearance. It has of late been ſuppoſed that all earths are metallic oxyds, and that all of them would be capable of reduction, were we poſſeſſed of any body for which oxygene had a ſtronger elective attraction than that by which it is kept in conjunction with the baſes of theſe ſuppoſed oxyds. But this opinion, being perfectly unſupported by experiment, cannot be admitted in a ſcience which, like the chemiſtry of the preſent day, aſpires to demonſtration.

The term oxyd, however, is not confined to the combinations of metals with oxygene, but expreſſes that firſt degree of oxygenation in all bodies which, without converting them into acids, cauſes them to approach to the nature of ſalts; and of theſe there is a prodigious variety; as the oxyd of phoſphorus, which is the white concrete ſubſtance into which that body is converted by combuſtion; the oxyd of azote, or nitrous air of Dr Prieſtley; and a great many others. Moſt of the oxyds from the vegetable and animal kingdoms have baſes compounded of different ſimple combuſtible bodies. Thus ſugar, all the gums, mucus, and ſtarch, are vegetable oxyds; the baſes of which are hydrogene and carbonne, combined in various proportions. We find accordingly, that all theſe bodies are, by farther additions of oxygene, convertible into acids; and it is probable that theſe acids differ from each other only in the proportion of the hydrogene and carbonne in their baſes. The baſes of the animal oxyds are ſtill more complicated; all, or moſt of them, conſiſting of various combinations of azote, phoſphorus, hydrogene, carbonne, and ſulphur. See Calx, Chemistry, and Table of Chemical nomenclature.

OXYDATION, is a term employed by the later chemiſts to expreſs the proceſs by which bodies are converted into oxyds; and it is allowed on all hands to be exactly ſimilar to combuſtion. The nature of this proceſs has been much diſputed; and the queſtion on this ſubject involves in itſelf great part of the controverſy between the followers of the immortal Stahl and the juſtly celebrated Lavoiſier, the founders of the phlogiſtic and antiphlogiſtic theories, which have for ſome years divided the chemical world. A view of this queſtion, ſufficiently diſtinct, may be taken from the caſe of metals and their oxyds. Metallic calces (*oxyds* ſay the phlogiſtians) are ſimple bodies, which, when united with phlogiſton, form metals. The proceſs of *reduction* conſiſts in expoſing the ores of metals to an intenſe heat in contact with ſome inflammable body, moſt commonly charcoal. During this operation, ſay they, the charcoal being inflamed, parts with its phlogiſton, which is immediately abſorbed by the calx, and a metal is formed. Lavoiſier, and his followers, on the contrary, contend that metals are ſimple bodies; but that in the ſtate of oxyds, that is, as they commonly exiſt in their ores, they are combined with oxygene, but as oxygene at a high temperature is more ſtrongly attracted by charcoal than by moſt metals, during the proceſs of reduction the oxyd is decompounded, and the oxygene unites with the charcoal to form carbonic acid, leaving the regulus or metal free. On this point hinges the great queſtion, the deciſion of which muſt materially affect almoſt every part of chemical theory. Without preſuming to decide between theſe two opinions, the former of which is ſtill ſupported by one or two chemiſts of the firſt rank, we agree with Dr Black in thinking that, though there ſtill remain a few facts which have not been thoroughly explained on antiphlogiſtic principles, this theory is much more ſimple, and better ſupported by facts, than any that preceded it. It has this great advantage over the doctrine of Stahl, that it requires not the ſuppoſition of an arbitrary body, which does not affect our ſenſes, and of the exiſtence of which we have not even a ſhadow of proof. Perhaps we may farther venture to aſſert, that though it may be extremely difficult, or even impoſſible, to refute the phlogiſtic theory, influenced as we have all been by a ſtrong prejudice in its favour; yet, had it been brought forward for the firſt time, when our knowledge had arrived at the point which it now holds, it never would have been generally received. See Calcination, Chemistry, Combustion, Inflammation.

OXYGENE, a term adopted in the new chemical nomenclature, to expreſs the acidifying principle; from οξυς "acid," and γεινομαι "to generate." It is not found naturally in a ſeparate ſtate, but always combined or mixed with ſome other ſubſtance. In its aeriform or elaſtic ſtate, it is called by the French chemiſts *oxygenous gas*, and is the ſame as the *dephlogiſticated air* of

Prieſtley and Cavendiſh, the *empyreal air* of Scheele, the *vital air* and *pure air* of other modern chemiſts. It was called *dephlogiſticated* by the followers of Stahl's doctrine, who imagined it to be air deprived of phlogiſton; the epithet of *empyreal* was given to it by Mr Scheele, who firſt diſcovered it to be the only conſtituent part of the atmoſphere which contributes to ſupport inflammation or combuſtion. He made many curious experiments on inflammation, and was the firſt who completely analiſed common air, ſhowing it to conſiſt of 27 parts of empyreal, 72 of foul, and 1 of fixed air. He found, that theſe 27 parts only were conſumed by a burning body; and that theſe, during the act of combuſtion, were united and combined with the inflammable body burnt in them, ſo as to form a compound no longer combuſtible. Lavoiſier extending theſe experiments, found that the body, thus produced by empyreal air, being combined with the matter of the inflammable body burnt in it, was, in many caſes, an acid; in conſequence of which property he gave this air the name of *oxgene*, i. e. "the generator of acidity." He was perhaps [illegible] in adopting this name; for the ſame air [illegible] combination with inflammable matter, for[illegible] pounds that are by no means acid, of which we [illegible] tent ourſelves with producing only one example, namely *water*, which is the compound reſulting from the combination of this air with inflammable air. See WATER.

Common atmoſpheric air was found by Scheele to promote animal life in a manner ſomewhat ſimilar to its promoting combuſtion. He extended his experiments to this ſubject alſo; and he concludes, that this empyreal air is the only part of the atmoſphere which is capable of ſupporting animal life, and that no animal can exiſt a minute without it. In conſequence of this property it has been called *vital air.* Since, however, it is abſolutely neceſſary for the ſupport both of combuſtion and of animal life, and ſince neither of theſe can exiſt without it, both the terms *empyreal* and *vital* are deficient, expreſſing only certain properties of this claſtic fluid (which may be alſo ſaid of the word *oxygene*); and hence ſome later chemiſts have ſuggeſted the propriety of deſigning it by the name of *pure air.* See COMBUSTION, INFLAMMATION, CHEMISTRY, AIR, WATER.

OXYGLYCU, a ſpecies of drink prepared of the ſweeteſt honey-combs macerated and boiled. The combs, from which all the honey has been expreſſed, are put into a pot with pure water, and boiled till they ſeem to have depoſited all their contained honey in the water. This liquor is to be kept; and, when diluted with cold water, is to be drank in the ſummer-time, in order to remove thirſt.

OXYMEL, in pharmacy, a compoſition of vinegar and honey. See PHARMACY.

OYER, in law-books, ſeems to have been anciently uſed for what is now called *aſſiſes.* See ASSISE.

OYES, a corruption of the French OYEZ, *Hear ye*; a term or formula frequently uſed by the criers in our courts on making proclamations, or to enjoin ſilence.

OYSTER, in zoology. See OSTREA.

OYSTER-Catcher. See HÆMATOPUS.

OYSTER-Fiſhery. See *Oyſter-*FISHERY and OSTREA.

OYSTERS, Foſſils. The largeſt bed that is known of foſſile oyſters is that near Riding in Berkſhire. They are entirely ſhaped, and have the ſame ſubſtance with the recent oyſter-ſhells; and yet ſince the oldeſt hiſtories that mention the place give an account of them, we muſt ſuppoſe they have lain there for a long time. They extend over no leſs than ſix acres of ground; and juſt above them is a large ſtratum of a greeniſh loam, which ſome writers call a green earth, and others a green ſand. It is compoſed of a crumbly marle, and a large portion of ſand. Under them is a thick ſtratum of chalk. They all lie in a level bed; and the ſtrata above the ſhells are natural, and appear never to have been dug through till the time of finding the ſhells.

Phil. Tranſ. nº 261. p. 484.

The oyſter-ſhells and green earth united make a ſtratum of about two feet thick; and over this there is a much thicker ſtratum of a bluiſh and very brittle clay; but neither has this ever been dug through, except where the ſhells are found. This is vulgarly denominated *piercy-clay*, and is eſteemed uſeleſs. This clay-bed is about a yard deep, and above it is a ſtratum of fuller's earth, about two feet and a half deep; it is extremely [illegible] is uſed by the clothiers. Over this there [illegible] of a fine white ſand, unmixed either [illegible] clay or fuller's earth: this is near [illegible] and above it is a ſtratum of a ſtiff [illegible] which tiles are made. This is again co[illegible] vegetable mould; the depth however o[illegible] of the clay cannot be aſcertained, on [illegible] the unevenneſs of the hill. Theſe oyſters are occaſionally found whole, but moſt frequently in ſingle ſhells. When they are in pairs, there is generally ſome of the green ſand found within them: they ſeldom ſtick very [illegible] together; ſo that unleſs very carefully taken up, it is not eaſy to preſerve them in pairs.

OYSTER-Shells, an alkali far more generally allowed, and are in all better medicines than many of the more coſtly and pompous alkalis of the ſame claſs. The proof of alkalis is in their ſolution by acid ſpirits; and Mr Homberg found, that they diſſolved far eaſier in acids of nitre and ſea-ſalt, than either pearls or coral, or indeed than any of the reſt. This he ſuppoſes to be owing to their containing in the body of the ſhell a large portion of ſal-ſalſus, which is eaſily perceived upon the tongue, and which keeps the whole ſubſtance of the ſhell in a ſort of half diſſolved ſtate. Theſe ſhells are found to produce very ſenſible effects on the ſtomach, when it is injured by acid humours; and Mr Homberg thinks, that this eaſineſs of ſolution is a great argument for their good effects, and that the quantity of ſal-ſalſus which it contains, contributes not a little towards it; for we are not to look upon that as a ſalt merely, but as a ſalt of a peculiar nature, formed of ſea-ſalt by the organs of the animal, and the ſeveral fermentations it undergoes in the body of it, in the ſame manner as the nitrous and other ſalts of the earth ceaſe to be nitrous, &c. whenever they become blended with the juices of plants, and form with them a ſalt peculiar to that plant; which is evidently the caſe as far as reſpects this ſalt, it being plainly of a more penetrating taſte, and of a different ſmell, from the ſalt left by the ſea-water between the ſeveral external ſcales or flakes of the ſhell.

Mem. Acad. Par. 1700.

ſhell. Oyſter-ſhells being thus found by Mr Homberg to be a very valuable medicine, and as one of the common methods of preparing them is by calcination, which, he obſerves, conſiderably impairs their virtues, he gives the following method of preparing them for taking inwardly, which he himſelf always uſed. Take the hollow ſhells of the oyſters, throwing away the flat ones, as not ſufficiently good; make them perfectly clean, and then dry them in the ſun; when they appear dry, beat them to pieces in a marble mortar: they will ſtill be found to contain a large quantity of moiſture; lay them therefore again in the ſun till perfectly dried, and then finiſh the powdering them, and ſift the powder through a fine ſieve. Give 20 or 30 grains of this powder every morning, and continue it three weeks or a month. See Chemistry, nº 1087.

OZÆNA, a foul and malignant ulcer of the noſe, diſtinguiſhed by its fœtor, and often accompanied with a caries of the bones of the noſe.

OZANAM (James), an eminent French mathematician, born at Boligneux in Breſſe, in 1640, of a wealthy family. His [illegible] him a good education, and deſigned him for [illegible]; but ſome mathematical books falling into [illegible] hands, inſpired him with a love for that ſcience, [illegible] had no maſter to inſtruct him, he [illegible] in it, that, at 15 years of age, he [illegible] mathematics, which he thought [illegible] works he afterwards publiſhed. He [illegible] taught that ſcience at Lyons; and his [illegible] brought him in a conſiderable revenue, till the year 1701: at which period, a war breaking out on the ſucceſſion to the crown of Spain, he loſt almoſt all his ſcholars, and was reduced to a very melancholy ſituation; and his wife dying the ſame year, he was ſo afflicted, that he never perfectly recovered it. In 1702 he was admitted into the Royal Academy of Sciences; and died of an apoplexy in 1717.—He was of a mild and ſerene temper, of ſingular generoſity, and of a cheerful diſpoſition.—He would not allow himſelf to know more of religion than the common people. He uſed to ſay, that "it was the buſineſs of the doctors of the Sorbonne to diſpute, of the pope to decide, and of a mathematician to go to heaven in a perpendicular line." His works are very numerous, and have met with the approbation of the learned. The principal are, 1. Practical geometry, 12mo. 2. A mathematical dictionary. 3. A courſe of mathematics, 5 vols, 8vo. 4. Mathematical and philoſophical recreations, the moſt complete edition of which is that of 1724, in 4 vols, 8vo. 5. An eaſy method of ſurveying. 6. New elements of algebra, a work much commended by Monſ. Leibnitz. 7. Theoretical and practical perſpective, &c.

OZELL (John), a well-known tranſlator, educated in Chriſt's Hoſpital, was poſſeſſed of a competent fortune, and always enjoyed good places, being auditor-general of the city and bridge accounts, of St Paul's cathedral and of St Thomas's hoſpital. Notwithſtanding his attention to buſineſs, he ſtill retained a love for polite literature: and though he did not appear as an original author, yet having made himſelf maſter of moſt of the living languages, he favoured the world with many tranſlations from theſe, as well as from the Latin and Greek; which, if they are not the moſt elegant, are generally faithful and true to the originals. He died in the year 1743.

OZIAS, in ſacred hiſtory, the ſon of Micha, of the tribe of Simeon, one of the governors of Bethulia when it was beſieged by Holofernes. He vigorouſly ſupported the ſiege againſt this general, and received Achior into his houſe, when he had been driven from the Aſſyrian camp. Finding however at length that the city was reduced to great neceſſity for water, and that the people mutinied againſt him, he promiſed to ſurrender the place in five days, if in that time God did not ſend them relief. Judith (vi. vii. viii. ix. and x.) being informed of this reſolution, ſent to ſpeak with Ozias and the other leading men [illegible] made a prudent remonſtrance upon their [illegible] preſcribe a time to the Lord, in which he [illegible] them; encouraged them to patience; [illegible] diſcovering her deſign, told them that ſhe would go out in the night. Ozias being at the gate of the city when Judith departed, opened it to her, and waited in the city for the ſucceſs of her undertaking, praying with her people to God that he would be pleaſed to deliver them. See the article Judith.

OZLEWORTH, in England, in Glouceſterſhire, about 18 miles from Glouceſter. It is remarkable for nothing but that in one year, during the reign of Queen Elizabeth, there were no leſs than 231 foxes killed at it.

OZOLÆ, or Ozoli, a people who inhabited the eaſtern parts of Ætolia which were called *Ozolea*. This tract of territory lay at the north of the bay of Corinth, and extended about 12 miles. They received their name from the bad ſtench (ὀζη) of their bodies and clothes, which were the raw hides of wild beaſts. Some derive it from the ſtench of the ſtagnated water in the neighbouring lakes and marſhes. According to a fabulous tradition, they received their name from a very different circumſtance: During the reign of a ſon of Deucalion, a bitch brought into the world a ſtick inſtead of whelps The ſtick was planted into the ground by the king, and it grew up to a large vine, and produced grapes, from which the inhabitants of the country were called *Ozolæ*, not from ὄζειν, "to ſmell bad," but from ὄζος, "a branch or ſprout." The name *Ozolæ*, on account of its indelicate ſignification, was highly diſagreeable to the inhabitants; they therefore exchanged it ſoon for that of Ætolians.

P.

Pace.

P, the 15th letter and 11th conſonant of the alphabet; the ſound of which is formed by expreſſing the breath ſomewhat more ſuddenly than in forming the ſound of *b*; in other reſpects theſe two ſounds are pretty much alike, and are often confounded one with another. When *p* ſtands before *t* or *ſ*, its ſound is loſt; as in the words *pſalms*, *pſychology*, *ptolemaic*, *ptiſan*, &c. When placed before *h*, they both together have the ſound *f*; as in *philoſophy*, *phyſic*, &c.

P and *B* are ſo like each other, that Quintilian declares, that in the word *obtinuit*, his reaſon required him to put a *b*, but that his ears could hear nothing but a *p*, *optinuit*: hence in ancient inſcriptions, and old gloſſaries, it appears that theſe two letters have often been confounded. Several nations ſtill pronounce one for the other, the Welch and Germans particularly, who ſay, *ponum vinum*, for *bonum vinum*. Plutarch obſerves, it was uſual for thoſe of Delphi to ſay βαλειν for παλειν, βικρον for πικρον, and among the Latins, as often as an *s* followed, the *b* was changed into a *p*, as *ſcribo*, *ſcripſi*.

As an abbreviation, P ſtands for *Publius*, *Pondo*, &c. P. A. DIG. for *Patricia Dignitas*; P. C. for *Patres Conſcripti*; P. F. for *Publii Filius*; P. P. for *Propoſitum*, or *Propoſitum publice*; P. R. for *Populus Romanus*; P. R. S. for *Pretoris ſententia*, P. R. S. P. for *Praſes provinciæ*.

P. M. among aſtronomers, is frequently uſed for *poſt meridiem*, or "afternoon;" and ſometimes for *poſt mane*, "after the morning, i. e. after midnight." P was alſo uſed among the ancients as a numeral letter, ſignifying the ſame with the G, viz. a hundred; according to the verſe of Ugutio,

P ſimilem cum G numerum monſtratur habere.

Though Baronius thinks it rather ſtood for ſeven.

When a daſh was added a-top of $\overline{\text{P}}$, it ſtood for four hundred thouſand.

St Jerome obſerves on Daniel, that the Hebrews had no *P*; but that the *ph* ſerved them inſtead thereof; adding that there is but one word in the whole Bible read with a *P*, viz. *apadno*. The Greek π ſignified 80. On the French coins, *P* denotes thoſe that were ſtruck at Dijon.

In the Italian muſic, P ſtands for *piano*, or "ſoftly:" and P. P. P. for *pianiſſimo*, or "very ſoftly."

Among phyſicians, P ſtands for *pugil*, or the eighth part of an handful; P. Æ. *partes equales*, or equal parts of the ingredients; P. P. ſignifies *pulvis patrum*, or Jeſuit's bark in powder; and *ppt. preparatus* or prepared.

PABULUM, among natural philoſophers, the ſame with Fuel.

Paca, ſee Mus, p. 465.

PACE, a meaſure taken from the ſpace between the two feet of a man in walking; uſually reckoned two feet and a half, and in ſome men a yard or three feet. The geometrical pace is five feet; and 60,000 ſuch paces make one degree on the equator.

Pace.

Pace, in the manege, is of three kinds, viz. walk, trot, and gallop; to which may be added an amble, becauſe ſome horſes have it naturally.

Horſes which go ſhuffling, or with mixed paces between the walk and amble, are for the moſt part of no value; which commonly proceeds from their fiery temper, but ſometimes from a weakneſs in their reins or legs.

Pace (Richard), a learned Engliſhman, born about the year 1482. He was educated at the charge of Thomas Langton, biſhop of Wincheſter, whom he ſerved as an amanuenſis, and afterwards entered into the ſervice of cardinal Bainbridge. His accompliſhments rendered him ſo acceptable to Henry VIII. that he made him ſecretary of ſtate; and, entering into orders, he was admitted prebendary in the church of York, archdeacon of Dorſet, and dean of St Paul's, &c. which preferments were conferred on him during his abſence on foreign embaſſies. In 1524 he was ſent to Rome on the death of Pope Leo X. to ſolicit the papal chair for cardinal Wolſey; but a new pope was elected before his arrival, a circumſtance that proved the epocha of his troubles. He fell under the diſpleaſure of the diſappointed cardinal; and being ſoon after employed as ambaſſador at Venice, he was ſo neglected and hardly uſed, that he was ſeized with a frenzy: upon which the king ordered him home; and being carefully attended by the phyſicians at the king's command, he was in a ſhort time reſtored to the uſe of his reaſon, and then applied himſelf to the ſtudy of the Hebrew tongue. Being now introduced to his Majeſty, he remonſtrated againſt the cardinal's cruelty: who being ordered to clear himſelf, ſummoned Pace before him, ſitting in judgment with the duke of Norfolk and others; who condemned Pace, and ſent him to the Tower; where he remained two years, till he was diſcharged by the king's command.—When he was enlarged, he reſigned his deaneries, and died in retirement at Stepney in 1532; after having wrote ſeveral works. There is an elegant and juſt character of him by Leland, written upon his return from Venice. He was much eſteemed by the learned men of his time, eſpecially Sir Thomas More and Eraſmus. The latter had a great opinion of Pace on account of his candour and ſweetneſs of temper; ſo that he was much afflicted at his misfortunes, and could never forgive the man that cauſed them. Stow gives him the character of a right worthy man, and one that gave in council faithful advice: learned he was alſo, ſays that antiquary, and endowed with many excellent parts and gifts of nature; courteous, pleaſant, and delighting in muſic; highly in the king's favour, and well heard in matters of weight. There is extant a remarkable letter of his to the king, written in 1527, wherein he very honeſtly gives his opinion concerning the divorce: and Fiddes obſerves, that he always uſed a faithful liberty to the cardinal, which brought him at laſt to confinement and diſtraction.

PACHAMAC, a valley of Peru, in South America, ten miles ſouth of Lima; celebrated for its pleaſantneſs and fertility, but more on account of a magnificent temple built by the Incas of Peru, to the honour of their god. When the Spaniards conquered Peru, they found immenſe riches therein.

PACHODECARHOMBIS, in natural hiſtory, the name of a genus of foſſils, of the claſs of *ſelenitæ*. The word is derived from the Greek παχυς *thick*, δεκα *ten*, and ρομβος *a rhombus*, and expreſſes a thick rhomboidal body compoſed of ten planes. The characters of this genus are, that the ſelenitæ of it conſiſt of ten planes; but as the top and bottom in the leptodecarhombes, or moſt common kind of the ſelenitæ, are broader and larger planes than any of the reſt, the great thickneſs of this genus, on the contrary, makes it four longer planes in all the bodies of it, meeting in an obtuſe angle from its ſides, its largeſt planes. There are four ſpecies of it.

PACHSU, a ſmall iſland in the Mediterranean ſea; near the coaſt of Epirus, and in European Turkey. It lies ſouth of Corfu, and is ſubject to Venice.

PACIFIC OCEAN, that vaſt ocean which ſeparates Aſia from America. It is called *Pacific*, from the moderate weather the firſt mariners who failed in it met with between the tropics: and it was called *South Sea*, becauſe the Spaniards croſſed the iſthmus of Darien from north to ſouth when they firſt diſcovered it; though it is properly the Weſtern ocean with regard to America.

Geographers call the South Sea *Mare Pacificum*, "the Pacific Ocean," as being leſs infeſted with ſtorms than the Atlantic; but M. Frezier affirms it does not deſerve that appellation, and that he has ſeen as violent ſtorms therein as in any other ſea; but Magellan happening to have a very favourable wind, and not meeting with any thing to ruffle him when he firſt traverſed this vaſt ocean in 1520, gave it the name which it has retained ever ſince. Maty, however, adds, that the wind is ſo regular there, that the veſſels would frequently go from Acapulco to the Philippine Iſlands without ſhifting a ſail.

PACK, in commerce, denotes a quantity of goods made up in loads or bales for carriage. A pack of wool is 17 ſtone and 2 pounds, or a horſe's load.

PACKAGE, is a ſmall duty of one penny in the pound, paid for all goods not particularly rated.

PACKET, or PACKET *Boat*, a veſſel appointed by the government to carry the mail of letters, packets, and expreſſes from one kingdom to another by ſea in the moſt expeditious manner. Thus, the packet-boats, under the direction of the poſt-maſter-general of Great Britain, carry the mails from Dover to Calais, from Falmouth to Liſbon, from Harwich to Helvoetſluys, and from Parkgate to Dublin. See POST.

PACOS, in zoology, a name given to a ſpecies of camel, commonly, though improperly, reckoned a ſpecies of ſheep; and known among many by the name of the *Indian ſheep*, or *Peruvian ſheep*. See CAMELUS, p 60.

This creature has been accounted a ſheep, becauſe its hair is ſo long as to reſemble wool, and it is prodigiouſly thick, its head and neck alone having more wool on them than the whole body of our largeſt ſheep. Its body is clothed in the ſame proportion with a woolly hair equally fine.

PACTOLUS (anc. geog.), a river of Lydia, called *Chryſorrhoas*, from its rolling down golden ſand, according to Herodotus, Plutarch, Pliny, and Strabo; riſing in mount Tmolus (Strabo). From this river Crœſus is thought to have had all his riches. In Strabo's time it ceaſed to roll down any. It ran through Sardes; after which it fell into the Hermus, and both together into the Ægean ſea at Phocæa in Iona. A river celebrated by Virgil, Ovid, Lucon, Lycophron, Horace, Appollonius.

PACUVIUS (Marcus), of Brunduſium in Calabria, a tragic poet in high reputation about the year of Rome 600. He was nephew of Ennius; publiſhed ſeveral theatrical pieces, though we have only ſome fragments of his poetry remaining; and died at Tarentum at above 90 years of age.

PADAN-ARAM (Bible), literally *the plains of Aram*, or *Syria*; tranſlated by the Seventy ſimply *Meſopotamia*, or *Meſopotamia of Syria*; by the Vulgate, *Syria*; the Syrians on this and on the other ſide of the Euphrates, not differing remarkably from each other in language and manners, as Joſephus allows.

PADDOC, or PADDOC-*Courſe*, a piece of ground encompaſſed with pales or a wall, and taken out of a park, for exhibiting races with greyhounds, for plates, wagers, or the like.

A paddoc is generally a mile long, and a quarter of a mile broad: at the one end is a little houſe where the dogs are to be entered, and whence they are ſlipped; near which are pens to incloſe two or three deer for the ſport. Along the courſe are ſeveral poſts, viz. the low poſt, which is 160 yards from the dog-houſe and pens; the quarter of a mile poſt, half-mile poſt, and pinching poſt; beſides the ditch, which is a place made to receive the deer, and preſerve them from farther purſuit. And near this place are ſeats for the judges choſen to decide the wager.

The keepers, in order to ſlip the dogs fairly, put a falling collar upon each, ſlipped round a ring; and the deer being turned looſe, and put forward by a teazer, as ſoon as he is arrived at the low poſt, the dog-houſe door is thrown open, and the dogs ſlipped. If now the deer ſwerve ſo much, as that his head is judged nearer the dog-houſe than the ditch before he arrive at the pinching-poſt, it is no match, and muſt be run over again three days after: but if the deer runs ſtraight beyond the pinching poſt, then that dog which is neareſt when he ſwerves, or is blanched by any accident, wins the match; but if no ſuch ſwerve happens, then the match is won by the dog who firſt leaps the ditch.

PADERBORN, a duchy of Germany in the circle of Weſtphalia, has the county of Lippe on the north and weſt; Heſſe-Caſſel and Waldeck, on the ſouth;

and Munſter, with the duchy of Weſtphalia, on the weſt. Its greateſt length from eaſt to weſt is about 40 miles, and its breadth where wideſt 30. Some parts of it yield good paſture, and breed abundance of cattle; but it is not very fruitful in corn. There is a heath called the *Senne* or *Sende*, of great extent, but very barren and deſolate. There are, however, good iron mines in the country, with ſalt and medicinal ſprings, plenty of deer and other game; and it is watered with ſeveral rivers abounding with fiſh, as the Weſer, the Dimer, the Biver, the Nette, the great Emmer, the Lippe, the Alme, and the Pader. It contains 54 pariſhes, in which are 25 market towns and 16 monaſteries. The Roman Catholic is the predominant religion of the country, yet there are alſo many Proteſtants in it. The biſhopric was erected by Charlemagne, towards the cloſe of the eighth century, and the cathedral was conſecrated by pope Leo in perſon, anno 796. The biſhop is ſovereign of the country, a prince of the empire, and ſuffragan of the archbiſhop of Mentz. His revenue is about 30,000 pounds a year, and he is able to raiſe 3000 men. In the matricula his aſſeſſment is 18 horſe and 3[illegible] or 352 florins monthly in lieu of them. Towards [illegible] charges of the ſovereign courts of the empire, [illegible] for each term 162 rix-dollars and 29 kruitzers. [illegible] chapter conſiſts of 24 capitular canons, who muſt prove their noble extraction by four deſcents. The arms of the biſhopric are a croſs or, in a field gules. For the government of it, and the adminiſtration of juſtice, there are ſeveral councils and colleges under the biſhop. Here are alſo a hereditary marſhal, ſewer, cup-bearer, chamberlain, ſteward, and purveyor. It was in this biſhopric that Quintilius Varus, with the Roman army under his command, was routed by the Germans under Arminius.

Paderborn, the capital of the above biſhopric. It ſtands 40 miles north-weſt of Caſſel, 50 ſouth-eaſt of Munſter, and 60 ſouth-weſt of Hanover; being a large, populous, well-built, and well fortified city. Its name is compounded of *pader*, a rivulet, which riſes juſt under the high altar of the cathedral, and *born*, *i. e.* a ſpring. It was one of the Hanſe-towns; and, till 1604, an imperial city. The cathedral is a grand fabric, inferior to few in the empire. There is a gold crucifix in it of 60 pounds weight, preſented by Otho II. The univerſity, of which the Jeſuits have the direction, was founded in 1592, and the walls were built in the beginning of the 11th century. In 1530 an attempt was made to introduce Lutheraniſm; but 16 of the principal citizens who had embraced it were executed, and the reſt obliged to abjure it. Duke Chriſtian of Brunſwick carried off from hence, in 1692, the ſilver images of the twelve apoſtles, and the ſilver coffin of St. Lotharius; and had them coined into money, with this inſcription, *God's Friend, the Prieſt's Enemy*. The trade of this town, though formerly great, is now inconſiderable; and the inhabitants ſubſiſt moſtly by agriculture and breeding of cattle. Though the biſhop has a palace in the city, he reſides (when he vouchſafes to viſit this country, which is ſeldom, having other and more valuable benifices) at Neuhaus, ſeven miles off, where he has a magnificent caſtle. Charlemagne and other emperors ſometimes reſided here, and held diets of the empire.

PADOGI, a puniſhment uſed in Ruſſia. The body of the criminal is ſtripped to the waiſt, and then laid upon the ground; one ſlave holds the head of the perſon to be puniſhed between his knees, and another the lower part of the body; then rods are applied to the back till ſome perſon gives notice to deſiſt, by crying out, enough. This puniſhment is conſidered in Ruſſia merely as a correction of the police, exerciſed on the ſoldier by military diſcipline, by the nobility on their ſervants, and by perſons in authority over all ſuch as are under their command. After the acceſſion of Elizabeth to the throne of Ruſſia, the puniſhments were reduced to two kinds, viz. the padogi and Knout.

PADUA, an ancient, large, and celebrated city of Italy, with a univerſity and a biſhop's ſee. It is alſo capital of the Paduano; but is much leſs conſiderable than it was formerly: for it now contains no more than 3[illegible],000 inhabitants, whereas it formerly had 10[illegible],000, and many of the houſes are gone to ruin: however, the hall where juſtice is adminiſtered is a ſuperb ſtructure. The [illegible] and the college of the univerſity, [illegible] led the *Old Town*; and there are p[illegible] houſes, where perſons may walk [illegible] to the weather. The garden of [illegible] curious, on account of the number of plants. Here a ſtudent may take his degrees, let him be of what ſect of Chriſtianity he will; nay, though he ſhould be a Jew or a Turk. The patron of this city is St Anthony, who lies in the cathedral; they have ſuch a veneration for him, that the beggars do not aſk charity in the name of God, but for the love of St Anthony. The Jews live in a diſtinct part of the city; and the neighbouring mountains produce excellent wine and oil, with delicious fruit. It was taken by the Venetians in 1706. It is ſeated on the rivers Brentac and Bachiglione, in a fine plane, and is about ſeven miles in circumference. E. Long. 11. 55. N. Lat. 45. 24.

PADUAN, among the medaliſts, a modern medal ſtruck in imitation of the antique, or a new medal ſtruck with all the marks and characters of antiquity. This name is properly applicable to thoſe medals only that were ſtruck in the ſeventh century by an Italian painter born at Padua; who ſucceeded ſo well in the impoſture, that the beſt judges are at a loſs to diſtinguiſh his medals from the genuine ones. Though it is frequently uſed in general for all medals of this kind.

PADUANO, a ſmall province of Italy, in the territory of Venice, bounded on the eaſt by the Dogado, on the ſouth by the Poleſino di Rovigo, on the weſt by the Veroneſe, and on the north by the Vicentino. Its ſoil is well watered; and is one of the moſt fertile in Italy. The province is about 40 miles in length, and 35 in breadth. Padua is the capital town.

PADUS, anciently called *Eridanus*, eſpecially by the Greeks; a river famous for the fable of Phæton, (Ovid). It riſes in mount Veſulus, in the Alpes Cothiæ, from three ſprings, dividing the Ciſalpine Gaul into the Tranſpadana and Ciſpadana, (Strabo); and ſwelled by other rivers falling into it on each ſide from the Alps and Apennines, it diſcharges itſelf with a courſe from weſt to eaſt, at ſeven mouths, into the Adriatic (Mela). The lake through which it diſcharges itſelf into the ſea, is called by the natives the *Seven Seas*. Now the *Po*.

PADUS, in botany. See PRUNUS.

PÆAN, among the ancient pagans, was a ſong of rejoicing ſung in honour of Apollo, chiefly uſed on occaſions of victory and triumph. See APOLLO.

PÆAN, in the ancient poetry, a foot conſiſting of four ſyllables; of which there are four kinds, the pæan primus, ſecundus, &c.

The pæan primus conſiſts of one long ſyllable and three ſhort ones, or a trochæus and pyrrhichius, as *temporibus;* the pæan ſecundus conſiſts of a ſhort ſyllable, a long, and two ſhort, or an iambus and a pyrrhichius, as *potentia;* the pæan tertius conſiſts of two ſhort ſyllables, a long and a ſhort one, or a pyrrhichius and a trochæus, as *animatus;* the pæan quartus conſiſts of three ſhort ſyllables and a long one, or a pyrrhichius and iambus, as *celeritas*.

PÆDEROTA, in botany: A genus of the monogynia order, belonging to the pentandria claſs of plants; and in the natural [illegible] ranking under the 30th order, *Contortæ*. [illegible] ty, brittle, and diſpermous; the [illegible]

PÆDO BAPTISM, [illegible] or that conferred on children; from [illegible] *infant*, and [illegible] *baptiſm*. This has been the ſubject of great controverſy in the church. See ANABAPTISTS, BAPTISTS, &c.

PÆONIA, PIONY: A genus of the digynia order, belonging to the polyandria claſs of plants; and in the natural method ranking under the 26th order, *Multiſiliquæ*. The calyx is pentaphyllous; the petals five; there are no ſtyles; the capſules are polyſpermous. There are two ſpecies, both of them very hardy, and will flouriſh in any common ſoil. They are large herbaceous flowery perennials, with tuberous roots, ſending up ſtrong annual ſtalks from one to three feet in height; terminated by very large flowers of a beautiful red colour, and much larger than any roſe. The common officinal, or male piony, alſo is remarkable for its capſules turning backward, opening and diſplaying their red inſide, together with the numerous ſeeds, in a ſingularly agreeable order, appearing very ornamental after the flower is paſt. The plants may be propagated either by parting the roots or by ſeed. This plant was formerly celebrated in nervous diſtempers, but the preſent practice pays very little regard to it.

PÆSTUM, called *Poſidonia* by the Greeks, a town of Lucania, on the Sinus Pæſtinus; an ancient colony prior to the firſt Punic war, according to Livy; but later, according to Velleius. *Pæſtanæ roſæ* were in great eſteem, and produced twice a-year (Virgil, Ovid).

PAGAN (Blaiſe Francois Comte de), an eminent French mathematician, was born at Avignon in Provence, March 3. 1604; and took to the profeſſion of a ſoldier at fourteen, having been bred to it with the greateſt care. In 1620 he was engaged at the ſiege of Caen, in the battle of Pont de Ce, and the reduction of the Navareins, and the reſt of Bearn; where he ſignalized himſelf, and acquired a reputation far ſurpaſſing his years. He was preſent, in 1621, at the ſiege of St John d'Angeli, as alſo that of Clarac and Montauban, where he loſt his left eye by a muſket-ſhot. At this ſiege he had another loſs, which equally afflicted him, viz. that of the conſtable of Luynes, who died there of a ſcarlet fever. The conſtable was a near relation, and had been his patron at court. He did not, however, ſink under the misfortune, but on the contrary took freſh ſpirits from the neceſſity he was now in of truſting ſolely to himſelf. Accordingly there happened after this time neither ſiege, battle, nor any other occaſion, in which he did not ſignalize himſelf by ſome effort of courage and conduct. At the paſſage of the Alps, and the barricade of Suza, he put himſelf at the head of the forlorn hope, conſiſting of the braveſt youths among the guards; and undertook to arrive the firſt at the attack, by a private way which was extremely dangerous; when, having gained the top of a very ſteep mountain, he cried out to his followers, "See the way to glory!" He ſlipt along this mountain; and, his companions following him, they came firſt to the attack, as they wiſhed to do. They immediately began a furious aſſault; and, the army coming to aſſiſt, they forced the barricades. He had afterwards the pleaſure of ſtanding on the left hand of the king, when his majeſty related this heroic action to the Duke of Savoy with the deſerved commendations, in the preſence of a very full court When the king laid ſiege to Nancy in 1633, our hero had the honour to attend his ſovereign, in drawing the lines and forts of circumvallation. In 1642 his majeſty ſent him to the ſervice in Portugal, in the poſt of field marſhal. In this ſame year he unfortunately loſt his eye ſight by a diſtemper. But though he was thus diſabled from ſerving his country with his conduct and courage, he reaſſumed, with greater vigour than ever, the ſtudy of the mathematics and fortification; and, in 1645, gave the public a treatiſe on this latter ſubject. It was allowed by all who underſtood the ſcience, that nothing had then appeared that was preferable to it; and, indeed, whatever improvements have been made ſince, they have perhaps been derived chiefly from this treatiſe, as concluſions from their principles. In 1651 he publiſhed his Geometrical Theorems, which ſhow a perfect knowledge of all the parts of the mathematics. In 1655 he printed A Paraphraſe, in French, of the Account, in Spaniſh, of the River of the Amazons, by Father de Rennes, a Jeſuit; and we are aſſured, that, though blind, he drew the chart of that river and the parts adjacent which is ſeen in this work. In 1657 he publiſhed The Theory of the Planets, cleared from that multiplicity of eccentric circles and epicycles, which the aſtronomers had invented to explain their motions. This work diſtinguiſhed him among aſtronomers as much as that of fortifications did among engineers; and he printed, in 1658, his Aſtronomical Tables, which are very ſuccinct and plain. Few great men are without ſome foible: Pagan's was that of a prejudice in favour of judicial aſtrology; and though he is more reſerved than moſt others, yet we cannot put what he did on that ſubject among thoſe productions which do honour to his underſtanding. He was beloved and reſpected by all perſons illuſtrious for rank as well as ſcience: and his houſe was the rendezvous of all the polite and worthy both in city and court. He died at Paris Nov. 18. 1665; and was never married. The king ordered his firſt phyſician to attend him in his illneſs, and gave ſeveral marks of the extraordinary eſteem which he had for his merit.

He had an univerſal genius; and, having turned himſelf entirely to the art of war, and particularly to the branch of fortification, he made extraordinary progreſs in it. He underſtood mathematics not only better than is uſual for a gentleman whoſe view is to puſh his fortune in the army, but even to a degree of perfection ſuperior to that of the ordinary maſters who teach that ſcience. He had ſo particular a genius for this kind of learning, that he obtained it more readily by meditation than by reading authors upon it; and accordingly ſpent leſs time in ſuch books than he did in thoſe of hiſtory and geography. He had alſo made morality and politics his particular ſtudy; ſo that he may be ſaid to have drawn his own character in his *Homme Heroique*, and to have been one of the completeſt gentlemen of his time. Louis XIII. was heard to ſay ſeveral times, that the Count de Pagan was one of the moſt worthy, beſt turned, moſt adroit, and moſt valiant men, in his kingdom.—That branch of his family, which removed from Naples to France in 1552, became extinct in his perſon.

Pagan, a heathen, gentile, or idolater; one who adores falſe gods. See Mythology.

PAGANALIA, certain feſtivals obſerved by the ancient Romans in the month of January. They were inſtituted by Servius Tullius, who appointed a certain number of villages *(pagi)*, in each of which an altar was to be raiſed for annual ſacrifices to their tutelar gods; at which all the inhabitants were to aſſiſt, and give preſents in money, according to their ſex and age, by which means the number of country-people was known. The ſervants upon this occaſion offered cakes to Ceres and Tellus, to obtain plentiful harveſts.

PAGANELLUS, in ichthyology. See Gobius.

PAGANISM, the religious worſhip and diſcipline of pagans; or, the adoration of idols and falſe gods. See Idolatry, Mythology, and Polytheism.

PAGEANT, a triumphal car, chariot, arch, or other like pompous decoration, variouſly adorned with colours, flags, &c. carried about in public ſhows, proceſſions, &c.

PAGI (Antony), a very famous Cordelier, and one of the ableſt critics of his time, was born at Rogne in Provence in 1624. He took the habit in the convent at Arles in 1641, and was at length four times provincial of his order; but his religious duties did not prevent his vigorous application to the ſtudy of chronology and eccleſiaſtical hiſtory, in which he excelled. His moſt conſiderable work is, A Critique upon the Annals of Baronius; where, following the learned cardinal year by year, he has rectified an infinite number of miſtakes both in chronology and in the repreſentation of facts. He publiſhed the firſt volume in 1689, dedicated to the clergy of France, who allowed him a penſion: the whole was printed after his death, in 4 vols folio, at Geneva, in 1705, by the care of his nephew Francis Pagi, of the ſame order. He wrote ſome other things before his death, which happened in 1699; and had the character of an able hiſtorian as well as of a learned and candid critic. His nephew Francis, above mentioned, wrote A Chronological Abridgment of the Hiſtory of the Popes, in Latin, 3 vols 4to. Francis had alſo a nephew, Anthony Pagi, who added three more volumes to the Hiſtory of the Popes; of which two more were intended, if not executed.

PAGNINUS (Sanctes), an Italian Dominican, eminent for his ſkill in Oriental languages and biblical learning, was born at Lucca in 1466, and became afterwards an eccleſiaſtic of the order of St Dominic. He was deeply and accurately ſkilled in Latin, Greek, Hebrew, Chaldee, and Arabic; but he was particularly excellent in the Hebrew. He applied himſelf to examine the vulgar tranſlation of the Scriptures; and believing it to be either not of Jerome, or greatly corrupted, he undertook to make a new one from the preſent Hebrew text; in which he meant to imitate St Jerome, who ſet about making a new tranſlation at a time when the church would admit no other but the Septuagint. This deſign of Pagninus, ſo early after the reſtoration of letters, ſeemed a bold one; yet ſuch was the reputation of the man, that it was approved by Pope Leo X. who promiſed to furniſh him with all neceſſary expences for carrying on the work: and, beſides, we find at the beginning of this tranſlation, which was [illegible] Lyons in 1527, two letters of the ſucceeding popes, Hadrian VI. and Clement VII. which [illegible] the printing of it. Pagninus, in his Letters to [illegible] Clement, for the printing of this tranſlation, openly declares, that the Vulgar edition, as it is at preſent, is not St Jerome's; yet adds, that he has retained in his tranſlation as much of it as he could. It appears by a letter of Picus Mirandula to Pagninus, that he had ſpent 25 years upon this tranſlation. It is the firſt modern tranſlation of the Bible from the Hebrew text; and the Jews who read it affirmed, that it agreed exactly with the Hebrew, and was in ſome reſpects ſuperior to the ancient tranſlations. The great fault of Pagninus was, that he adhered with too great ſervility to the original text; and this ſcrupulous attachment made his tranſlation, ſays Father Simon, "obſcure, barbarous, and full of ſoleciſms. He imagined, that to make a faithful tranſlation of the Scriptures, it was neceſſary to follow exactly the letter according to the ſtrictneſs of grammar. This, however, is quite contrary to his pretended exactneſs, becauſe two languages ſeldom agree in their ways of ſpeaking; and therefore, inſtead of expreſſing the original in its proper purity, he defaces and robs it of all its ornaments." Father Simon nevertheleſs allows the great abilities and learning of Pagninus; and all the later commentators and tranſlators of the Scriptures have agreed in giving him his juſt praiſe. Huetius, though he thinks Father Simon's criticiſm of him juſt and well grounded, yet propoſes his manner as a model for all tranſlators of the ſacred books: *Scripturæ interpretandæ rationis utile nobis exemplar propoſuit Sanctus Pagninus.* He alſo tranſlated the New Teſtament from the Greek, as he had done the Old from the Hebrew, laying the Vulgar all the while before him; and dedicated it to Pope Clement VII. He was author of an Hebrew Lexicon, and an Hebrew Grammar; which Buxtorf, who calls him *vir linguarum Orientalium peritiſſimus*, made great uſe of in compiling his. He died in 1536, aged 70. Luther ſpoke of him and his tranſlations in terms of the higheſt applauſe.

PAGO, an iſland in the gulph of Venice, ſeparated from the continent of Morlachia by a narrow channel. The ancient geographers have left us no deſcription of it; "though (as Fortis obſerves) its form (A), extent, and rich produce, unqueſtionably deſerved it." And this is the more unaccountable, as we know the Romans were well acquainted with it; and on the other iſlands adjoining to it are many veſtiges of buildings, inſcriptions, tiles, and hewn ſtones, all ſure ſigns of Roman habitations. Its ancient name was in all probability *Portunata*. "This iſland (ſays Mr Fortis *) is extended from north to ſouth over againſt maritime Croatia, or the mountain Morlacca. It is about 50 miles long; its breadth is unequal. One particular circumſtance diſtinguiſhes it from all the other iſlands of the Adriatic, and is a large internal ſalt water lake 15 miles long from ſouth to north, into which the ſea enters by a canal not above a quarter of a mile broad in ſome places. This lake is frequented by the tunny fiſh, which, when once in, cannot return again to the ſea. There are alſo two ſmaller lakes on the iſland; one near Vlaſſich, abounding in fiſh, particularly eels; and one near the hamlet of Slabine.

"In this iſland the winter is dreadfully cold, and the ſummer ſcorchingly hot. Thoſe who have been there in the winter time ſpeak of it as a Siberia quite covered with ſnow and ice, and always expoſed to the cold north wind; I, who was there in the hot ſeaſon, thought it equal to the moſt ſcorching parts of the world. The naked rocks, which not only form the organization, but alſo the ſuperficies of almoſt all the iſland; the narrowneſs of the valleys; the reverberation of the water of the lake, generally quite calm in ſummer; multiply the heat ſo prodigiouſly among thoſe ſtones, that the vines, which are planted all round the lake, ripen the grapes by the beginning of Auguſt; and the few other products that grow there anticipate the uſual time of maturity in the ſame manner. The meteors are exceedingly irregular in the ſummer time; ſudden whirlwinds are frequent, and heavy ſhowers of rain: the laſt are hurtful to the inhabitants of one part of the iſland, and are favourable to the cultivation of the oppoſite end.

"They cultivate neither corn nor oil on this iſland; but it produces plenty of wine, and an immenſe quantity of ſalt. The other products are wool, honey, and a little ſalt fiſh. The quantity of wine amounts annually, on a medium, to 40,000 Venetian barrels; and from the huſks they diſtil 2000 barrels of *rakia* or brandy. The ſalt, in 1663, amounted to 800,000 Venetian *ſtare*. The ſalt-works are well contrived and well kept: they extend along a ſhallow pool, which forms the eaſtern extremity of the lake within for four miles in length and about half a mile in breadth. On the ſides of this fen the beſt part of the vines lie; but the upper part of the hills on each ſide is altogether naked and barren; there is not even a ſufficiency of fire-wood, and the inhabitants are obliged to provide themſelves elſewhere. The ſoil at the foot of the hills, where the vines are planted, is full of gravel and ſmall ſtones: and hence the wine is of good quality. The air is not unhealthful, notwithſtanding the vicinity of the ſalt-pits; but the frequent high winds carry off the noxious exhalations. The moſt conſiderable product of the iſland is the ſalt. The greateſt part of the people of Pago live by working in the ſalt-pits, and have a comfortable ſubſiſtence regularly paid by the government: it is therefore a very important circumſtance for the inhabitants of the city to have a dry ſummer; and hence the ignorant vulgar look upon rain as a miſchief brought upon the country by the force of witchcraft. In conſequence of this idea they elect a friar to exorciſe the meteors, and keep the rain off the iſland. If, notwithſtanding the poor friar's endeavours, the ſummer happens to be rainy, he loſes his reputation and his bread; but if two or three dry ſeaſons follow ſucceſſively, he meets with great reverence and advantage. Part of the ſalt-works belongs to the government, and the reſt to private proprietors; they are meliorated every year; and for that end the public lends money to thoſe proprietors who want it, and who without that aſſiſtance could not make the requiſite improvements.

"Many veſtiges of ancient habitations ſtill remain on the iſland of Pago, as well as of walled places, which either have been deſtroyed by the incurſions of enemies or by time. Hiſtorians ſay that the iſland was often abandoned by its inhabitants; and indeed it is rather to be wondered at how men ever could reſolve to ſettle in ſo wretched a country. The ſmall number of inhabitants, after ſo many years of peace and tranquillity under the Venetian government, evidently proves how little the iſland is really habitable. The town of Pago was built by the Venetians about 300 years ago; and contains upwards of 2000 inhabitants, and all the reſt of the iſland ſcarcely 900. The difficulty of acceſs to the city of Pago, and the ill ac-

* Travels into Dalmatia.

(A) Its figure is indeed remarkably irregular, its breadth being in no proportion to its length; for one of the extremities, called *Punta di Loni*, is above ten miles long, and leſs than one broad. Almoſt all the circumference is diſmal, without trees or any kind of viſible plants or graſs, ſteep, craggy, and uninhabited. On entering the lake through the channel that communicates with the ſea, nothing is to be ſeen either on the right or left but bare hanging rocks, ſo disfigured on the outſide by the violent percuſſion of the waves, that the ſtratification is hardly diſtinguiſhable. In general, the ſtone of the iſland is of the ſame kind as the Iſtrian, or *breccia*; and, beſides, there are large ſtrata of blue and yellowiſh ſand-ſtone. The channel, or inward bay of Pago, is not a harbour; on the contrary, it is a very dangerous ſtation, and even inacceſſible in winter, when the boreal wind blows with ſuch fury, that the inhabitants of the town dare not ſtir out of their houſes, and much leſs the few that are ſcattered over the country. The ſky appears always cloudy in that ſeaſon, by the thick miſt that riſes from the repercuſſion of the waves on that long chain of rough and hollow rocks.

Pago, Pagod.

commodation that ſtrangers meet with, make it very little frequented. Hence the inhabitants are as wild and unpoliſhed as if they lay at the greateſt diſtance from the ſea and the commerce of polite people. The gentry, who pretend to ſhow their manners different from thoſe of the vulgar, are truly grotesque figures, both in their dreſs, behaviour, and inſolent pretenſions. The ignorance of their clergy is incredible; a prieſt of the greateſt conſequence there, and who was thought a man of learning, did not know how Pago was called in Latin. There are two convents of friars in Pago and one of nuns; and ſeveral churches, all in very bad order, and ill ſerved. At Terra Vecchia alſo there is a convent of Franciſcan monks; a race of men who, under various names and diſguiſes, infeſt every place where credulous ignorance can be perſuaded to maintain the idle and ſuperſtitious. One ſuperſtitious cuſtom, amongſt a variety of others, exiſts among their women, and particularly among thoſe who have been married but a ſhort time: if their huſband happens to die, they tear their hair out in good earneſt, and ſcatter it on the coffin; and this ceremony is ſo much conſecrated by [illegible] though ſhe had notori-

PAGOD, or PAGODA, a [illegible] Indians to the temples where they worſhip their gods. We ſhall not in this place enter into a full detail of the ſeveral pagodas of different nations, and their peculiar circumſtances. Theſe matters ſeem to come in more properly under the *religion*, or, as others will call it, the *ſuperſtition*, of the people to whom they belong. We ſhall therefore content ourſelves in the preſent article with an account of a paper in the *Aſiatic Reſearches*, concerning the ſculptures, &c. at Mavalipuram, a few miles north of Sadras, and known to ſeamen by the name of the *ſeven pagodas*.

The monuments which Mr Chambers (who communicated the paper) deſcribes, appear, he ſays, to be the ruins of ſome great city decayed many centuries ago. "They are ſituated cloſe to the ſea, between Covelong and Sadras, ſomewhat remote from the high road that leads to the different European ſettlements. And when viſited in 1776, there was ſtill a native village adjoining to them which retained the ancient name, and in which a number of *bramins* reſided that ſeemed perfectly well acquainted with the ſubjects of moſt of [illegible] The rock, or rather [illegible] they approach the coaſt, and to them the place known by the name of the *Seven Pagodas*, poſſibly becauſe the ſummits of the rock have preſented them with that idea as they paſſed: but it muſt be confeſſed that no aſpect which the hill aſſumes as viewed on the ſhore, ſeems at all to authoriſe this notion; and there are circumſtances, which will be mentioned in the ſequel, that would lead one to ſuſpect that this name has ariſen from ſome ſuch number of pagodas that formerly ſtood here, and in time have been buried in the waves." The rock here mentioned, as it riſes abruptly out of a level plain of great extent, naturally engroſſes the attention of the eye. It conſiſts chiefly of a ſingle ſtone; and in its ſhape (which is ſingular and romantic), in a diſtant view, it has the appearance of an antique and lofty edifice. Works of imagery and ſculpture crowd thicker upon the eye on a nearer approach, and at firſt ſight at leaſt favours the idea of a petrified town, which, through the credulity of travellers[*], has been ſuppoſed to exiſt in various parts of the world. "Proceeding on by the foot of the hill on the ſide facing the ſea, there is a pagoda riſing out of the ground of one ſolid ſtone, about 16 or 18 feet high, which ſeems to have been cut upon the ſpot out of a detached rock that has been found of a proper ſize for that purpoſe. The top is arched, and the ſtyle of architecture according to which it is formed, different from any now uſed in thoſe parts." Beyond this a numerous group of human figures in baſs relief, conſiderably larger than life, attract attention. They repreſent conſiderable perſons, and their exploits, many of which are now very indiſtinct thro' the injuries of time, aſſiſted by the corroding nature of the ſea air; others, while protected from that ele- [illegible]

The hill, which is at firſt of eaſy aſcent, [illegible] other parts rendered more ſo, by very excellent ſteps cut out in ſeveral places, where the communication would be difficult or impracticable without them. A winding ſtair of this ſort leads to a kind of temple cut out of the ſolid rock, with ſome figures of idols in high relief upon its walls, very well finiſhed and perfectly freſh, as it faces the weſt, and is therefore ſheltered from the ſea air." This temple our author conjectures to have been a place of worſhip appertaining to a palace; ſome remains of which ſtill exiſt, and to which there is a paſſage from the temple by another flight of ſteps. This conjecture (for it is brought forward as merely ſuch) is in ſome meaſure favoured by ſeveral ruins ſtill remaining, and by the tradition of the bramins who inhabit the place. This finiſhes the objects "on that part of the upper ſurface of the hill, the aſcent to which is on the north; but on deſcending from thence, you are led round the hill to the oppoſite ſide, in which there are ſteps cut from the bottom to a place near the ſummit, where is an excavation that ſeems to have been intended for a place of worſhip, and contains various ſculptures of Hindoo [illegible] figure of *Viſhnou* (A), aſleep on a kind of bed, with a huge ſnake wound about in many coils by way of pillow for his head; and theſe figures, according to the manner of this place, are all of one piece hewn from the body of the rock." Theſe works, however, although they are unqueſtionably ſtupendous, are, in our author's opinion, ſurpaſſed by others about a mile and a half to the ſouthward of the hill. "They conſiſt of two pagodas of about 30 feet long by 20 feet wide, and about as many in height, cut out of the ſolid rock, and each conſiſting originally of one ſingle ſtone. Near theſe alſo ſtand an elephant full as big as life, and

[*] See Shaw's *Travels*, 155, &c

(A) See a figure of *Viſhnou* in the plate of Indian gods, with its deſcription, under the article POLYTHEISM.

and a lion much larger than the natural ſize, but very well executed, each hewn alſo out of one ſtone. None of the pieces that have fallen off in cutting theſe extraordinary ſculptures are now to be found near or any where in the neighbourhood of them, ſo that there is no means of aſcertaining the degree of labour and time that has been ſpent upon them, nor the ſize of the rock or rocks from which they have been hewn; a circumſtance which renders their appearance the more ſtriking and ſingular. And though their ſituation is very near the ſea-beach, they have not ſuffered at all by the corroſive air of that element, which has provided them with a defence againſt itſelf, by throwing up before them a high bank that completely ſhelters them. There is alſo great ſymmetry in their form, though that of the pagodas is different from the ſtyle of architecture according to which idol temples are now built in that country. The latter reſembles the Egyptian; for the towers are always pyramidical, and the gates and roofs flat and without arches; but theſe ſculptures approach nearer to the Gothic taſte, being ſurmounted by arched roofs or domes that are not ſemicircular, but compoſed of two ſegments of circles meeting in a point at top." Our author obſerves, that the lion in this group, as well as one on a ſtone couch in what he took to be a royal palace, are perfectly juſt repreſentations of the true lion, and the natives there give them the name which is always underſtood to mean a lion in the Hindoo language, to wit, *ſing*; but the figure which they have made to repreſent that animal in their idol temples for centuries paſt, though it bears the ſame appellation, is a diſtorted monſter totally unlike the original; inſomuch that it has from hence been ſuppoſed, that the lion was not anciently known in this country, and that *ſing* was a name given to a monſter that exiſted only in Hindoo romance. But it is plain that that animal was well known to the authors of theſe works, who, in manners as well as arts, ſeem to have differed much from the modern Hindoos.

"There are two circumſtances attending theſe monuments which cannot but excite great curioſity, and on which future inquiries may poſſibly throw ſome light. One is, that on one of the pagodas laſt mentioned, there is an inſcription of a ſingle line, in a character at preſent unknown to the Hindoos. It reſembles neither the Deyva-nâgre, nor any of the various characters connected with or derived from it, which have come to the writer's knowledge from any part of Hindoſtan. Nor did it, at the time he viewed it, appear to correſpond with any character, Aſiatic or European, that is commonly known. He had not then, however, ſeen the alphabet of the Balic, the learned language of the Siameſe, a ſight of which has ſince raiſed in his mind a ſuſpicion that there is a near affinity between them, if the character be not identically the ſame. But as theſe conjectures, after ſuch a lapſe of time, are ſomewhat vague, and the ſubject of them is perhaps yet within the reach of our reſearches, it is to be hoped that ſome method may be fallen upon of procuring an exact copy of this inſcription.

"The other circumſtance is, that though the outward form of the pagodas is complete, the ultimate deſign of them has manifeſtly not been accompliſhed, but ſeems to have been defeated by ſome extraordinary convulſion of nature. For the weſtern ſide of the moſt northerly one is excavated to the depth of four or five feet, and a row of pillars left on the outſide to ſupport the roof; but here the work has been ſtopped, and an uniform rent of about four inches breadth has been made throughout the ſolid rock, and appears to extend to its foundations, which are probably at a prodigious depth below the ſurface of the ground. That this rent has happened ſince the work began, or while it was carrying on, cannot be doubted; for the marks of the maſon's tools are perfectly viſible in the excavated part on both ſides of the rent, in ſuch a manner as to ſhow plainly that they have been divided by it. Nor is it reaſonable to ſuppoſe, that ſuch a work would ever have been deſigned or begun upon a rock that had previouſly been rent in two. Nothing leſs than an earthquake, and that a violent one, could apparently have produced ſuch a fiſſure in the ſolid rock: and that this has been the caſe in point of fact, may be gathered from other circumſtances, which it is neceſſary to mention in an account of this curious place. The great rock above deſcribed is at ſome ſmall diſtance from the ſea, perhaps 50 or 100 yards, and in that ſpace the Hindoo village before mentioned ſtood in 1776. But cloſe to the ſea are the remains of a pagoda built of brick, and dedicated to Sib, the greateſt part of which has evidently been ſwallowed up by that element; for the door of the innermoſt apartment, in which the idol is placed, and before which there are always two or three ſpacious courts ſurrounded with walls, is now waſhed by the waves, and the pillar uſed to diſcover the meridian at the time of founding the pagoda is ſeen ſtanding at ſome diſtance in the ſea. In the neighbourhood of this building there are ſome detached rocks, waſhed alſo by the waves, on which there appear ſculptures, though now much worn and defaced. And the natives of the place declared to the writer of this account, that the more aged people among them remembered to have ſeen the tops of ſeveral pagodas far out in the ſea, which being covered with copper (probably gilt) were particularly viſible at ſun-riſe, as their ſhining ſurface uſed then to reflect the ſun's rays, but that now that effect was no longer produced, as the copper had ſince become incruſted with mould and verdegreaſe."

From theſe circumſtances our author conjectures, and we think reaſonably, that the magnificent city of which theſe appear to be part of the ruins, has been deſtroyed partly by an earthquake, by which the rock was rent, and partly by a ſudden inundation of the ſea, occaſioned by this commotion of the earth. The bramins give an account of this matter peculiar to themſelves, filled with extravagance, fable, and folly; from which, however, with the aſſiſtance of ancient monuments, coins, and inſcriptions, ſome probable conjectures at leaſt, if not important diſcoveries, may, it is hoped, be made on theſe ſubjects, which are far from being unintereſting to us either as men, philoſophers, or Chriſtians. Our author thinks, therefore, that the inſcription on the pagoda mentioned above is an object which merits conſiderable attention; and he defends, by very reputable authorities, the conjecture which places it among the languages of *Siam*; but which it is unneceſſary for us either to abridge or to tranſcribe. In the courſe of this inquiry, our author remarks a very near reſemblance between *Sommonacodom*, the idol of the *Siameſe*, and the great idol Buddou, held ſacred by the *Chingelays*; and this reſemblance extends alſo to their prieſts. But from the detail of circumſtances which our author brings forward, and to which we refer, he thinks this a ſyſtem of religion different from that of the *Veds*, and ſome of them totally inconſiſtent with the principles and practice of the *bramins*; none of whom, as far as we can collect from Mr Knox †, exiſt among the Chingelays, whoſe religion is totally different from that of the preſent Hindoos. The only part in which there ſeems to be any agreement is in the worſhip of the Debtahs, which has probably crept in among them from the Tamulian neighbours, but that is carried on in a manner very different from the braminical ſyſtem, and appears to be held by the nation at large in very great contempt, if not abhorrence. Knox's account of it is this: "Their temples (*i. e.* thoſe of the Debtahs) are called *covels*," which is the Tamulic word for pagoda. He then goes on to ſay, "a man piouſly diſpoſed builds a ſmall houſe at his own charge, which is the [illegible] and himſelf becomes prieſt thereof. This hou[illegible] ſeldom called *God's Houſe*, but moſt uſually *Jac*[illegible] *Devil's*." But of the prevailing religion he ſpeaks in very different terms, and deſcribes it as carried on with much parade and ſplendour, and attended with marks of great antiquity. "The pagodas or temples of their gods (ſays he) are ſo many, that I cannot number them. Many of them are of rare and exquiſite work built of hewn ſtone, engraven with images and figures, but by whom and when I could not attain to know, the inhabitants themſelves being ignorant therein. But ſure I am they were built by far more ingenious artificers than the Chingelays that now are on the land. For the Portugueſe in their invaſions have defaced ſome of them, which there is none found that hath ſkill enough to repair to this day." In another place, he ſays, "here are ſome ancient writings engraven upon rocks which puzzle all that ſee them. There are divers great rocks in divers parts in Cande Uda, and in the northern parts. Theſe rocks are cut deep with great letters for the ſpace of ſome yards, ſo deep that they may laſt to the world's end. No body can read them or make any thing of them. I have aſked Malabars and Gentoos, as well as Chingelays and Moors, but none of them underſtood them. There is an ancient temple, Goddiladenni in Yattanour, ſtands by a place where there are of theſe letters." From all which the antiquity of the nation and their religion is ſufficiently evident, and from other paſſages it is plain, that the worſhip of Buddou, in particular, has been from remote times a very eminent part of their religion; for the ſame author, ſpeaking of the tree at Anurodgburro, in the northern part of the iſland, which is ſacred to Buddou, ſays, "the due performance of this worſhip they reckon not a little meritorious: inſomuch that, as they report, 90 kings have reigned there ſucceſſively, where, by the ruins that ſtill remain, it appears they ſpared not for pains and labour, to build temples and high monuments to the honour of this god, as if they had been born to hew rocks and great ſtones, and lay them up in heaps. Theſe kings are now happy ſpirits, having merited it by theſe labours." And again he ſays, "For this god, above all other, they ſeem to have an high reſpect and devotion," &c.

Such is the nature of Mr Chambers's communication, as far as it reſpects pagodas; a ſubject to which the *Aſiatic Society* will doubtleſs again direct their attention; and from the penetration and aſſiduity of its members we have much to expect. Other parts of this paper ſhall be brought forward under other articles, to which we refer. Few reſearches are of more ſervice to true religion, than thoſe which give us a correct view of the falſe and ſuperſtitious modes of worſhip practiſed by men who have had no light but reaſon, or weak and corrupted traditions. They are uſeful likewiſe to the philoſopher, as they always tend to give us a minuter view of the real nature of man as he is in himſelf, and ſhow with ſufficient ſtrength the imbecillity of the human intellect without ſome ſupernatural aid. The external pomp of all Pagan religions ſeems to have been their eſſence; a circumſtance which alone ſhows the neceſſity of that, the intention of which is to reform the heart. See Siam, Sommonacodon, Temple, &c.

Pagod, or *Pa*[illegible] is alſo the name of a gold and ſilver coin, [illegible] parts of the Eaſt Indies.

PAIN, [illegible]iou, ariſing from a ſudden and viol[illegible]tinuity, or other accident in the nerves, [illegible] veſſels, muſcles, &c. of the body. Pain, according to ſome, conſiſts in a motion of the organs of ſenſe; and, according to others, it is an emotion of the ſoul occaſioned by thoſe organs.

As the brain is the ſeat of ſenſation, ſo it is of pain Boerhaave, and moſt other authors [illegible]ect, aſſign a ſtretching of the nerves as the [illegible]te cauſe of pain: but as the nerves do not [illegible] conſiſt of fibres, this cauſe of pain does not [illegible] well-founded; nor indeed will it be eaſy to treat this ſubject clearly, but in proportion as the means of ſenſation are underſtood.

Many kinds of pain are met with in authors: ſuch as, A gravitative pain; in which there is a ſenſe of weight on the part affected, which is always ſome fleſhy one, as the liver, &c. A pulſative pain; which, Galen ſays, always ſucceeds ſome remarkable inflammation in the containing parts, and is obſerved in abſceſſes while ſuppurating. A tenſive pain, which is alſo called a *diſtending* pain; it is excited by the diſtenſion of ſome nervous, muſcular, or membranous part, either from ſome humour, or from flatulence. An acute pain is, when great pain is attended with quick and lively ſenſations; A dull pain is, when a kind of numbneſs is as much complained of as the pain is.

The mediate and more remote cauſes of pain are generally obvious; and when ſo, the cure will conſiſt for the moſt part in removing them: for though in many inſtances the chief complaint is very diſtant from the ſeat of theſe cauſes, yet their removal is the proper method of relief. See Medicine, *paſſim*.

Perhaps all pains may be included, with irritation, in thoſe that have ſpaſm or inflammation for their ſource. When pain is owing to inflammation, the pulſe is quicker than in a natural ſtate; it is alſo generally full, hard, and tenſe; the pain is equal, throbbing, and unremitting. If a ſpaſm is the cauſe, the pulſe is rarely affected; at intervals the pain abates, and then returns with

† *Hiſt. of Ceylon.*

with ſome degree of aggravation; gentle motion ſometimes abates, or even cures, in ſome inſtances: but in inflammatory caſes no ſuch effects are ever experienced. See Dr Lobb's *Treatiſe on Painful Diſtempers.*

The pain ſo frequently attendant on women in child-bed, called *after-pains* (from their happening only after being delivered of a child), are often occaſioned by ſcooping to fetch away coagulated blood, which is a needleſs endeavour. When no improper treatment in delivering the ſecundines can be ſuſpected, the irritability of the uterus alone is to be conſidered as the cauſe. Care ſhould be taken not to confound theſe after-pains with, or miſtake the pains attending puerperal fevers for, the colic. After pains come by fits, and ſoon go off; but return at different intervals, which are longer each day, and after two or three days are uſually at an end, though ſometimes they continue ſeven or eight: notwithſtanding theſe pains, the lochia flow properly and generally more abundantly after the ceſſation of each fit; this does not happen in cholicky complaints, nor is the belly ſo free from tumefaction when the puerperal fever is attendant.

As theſe pains are of the ſpaſmodic kind, anodynes and gentle opiates, with frequent draughts of warm caudle, camomile tea, &c. are all that are required in order to their relief.

Among the various cauſes of pain, a ſingular one is related in the third vol. of the *Lond. Med. Obſ. and Inq.* p. 241, &c. Some perſons who had taken cold during their being ſalivated, were afflicted with pains which reſiſted all the uſual methods of relief. At length the author of the narrative referred to ſuggeſted the cauſe; and by exciting a freſh ſalivation the pains abated: the ſpitting was kept up a little while, and permitted to abate with ſome caution; and thus the cures were completed.

PAINT[illegible]NG.

PAINTING is the art of [illegible] the eyes, by means of figures and [illegible] object in nature that is diſcernible by th[illegible] of ſometimes expreſſing, according to the principles of phyſiognomy, and by the attitudes of the body, the various emotions of the mind. A ſmooth ſurface, by means of lines and colours, repreſents objects in a ſtate of projection; a[illegible] repreſent them in the moſt pleaſant dreſs, and in a manner moſt capable of enchanting the ſenſes. [illegible]her, the objects which delight us by their animation and lively colours, ſpeak to the ſoul, by giving us the image of what we hold moſt dear, or by indicating an action which inſpires us with a taſte for innocent pleaſures with courage, and with elevated ſentiments. Such is the definition, and ſuch are the effects of painting.

By an admirable effort of human genius, painting offers to our eyes every thing which is moſt valuable in the univerſe. Its empire extends over every age and country. It preſents to us the heroic deeds of ancient times as well as the facts in which we are more converſant, and diſtant objects as well as thoſe which we daily ſee. In this reſpect it may be conſidered as a ſupplement to nature, which gives us only a view of preſent objects.

The art of painting is extremely difficult in the execution; and its merit can only be appreciated by thoſe who profeſs the art.

The painter who invents, compoſes, and colours conceptions which are only agreeable, and which ſpeak merely to the eye of the ſpectator, may be reckoned to poſſeſs the firſt merit in the ſtyle of embelliſhment and decoration.

The painter who is diſtinguiſhed for noble and profound conceptions; who, by means of a perfect delineation, and colours more capable of fixing the attention than dazzling the eye, conveys to the ſpectators the ſentiments with which he himſelf was inſpired; who animates them with his genius, and makes a laſting impreſſion on their minds; this artiſt is a poet, and worthy to ſhare even in the glories of Homer. [illegible] in forming this great idea of his art that the painter becomes himſelf great.

But if he ſeek only to pleaſe or aſtoniſh by the illuſion of colours, he muſt reſt contented with the ſecondary merit of flattering the eye with the variety and oppoſition of tints, or of making an induſtrious aſſemblage of a great multiplicity of objects. It is in painting as it is in poetry. The man who clothes trivial or common ideas in verſe, exercſes the profeſſion of twiſting ſyllables into a certain meaſure. The poet who clothes in good verſe ideas and ſentiments, that are merely agreeable, profeſſes an agreeable art. But he who by the magic of verſe, of ideas, of imagery, or of colours, adds ſublimity to the ſublime objects of nature, is a great poet and a great painter. He deſerves the crown which the nations have decreed to Homer, Virgil, Milton, Raphael, and the ſtatuary who modelled the ancient Apollo. It is reaſonable to place in the ſame claſs thoſe who have expreſſed the ſame ideas, whether it be in verſe or in colours, on braſs or on marble. The painter and ſtatuary, who excel in their profeſſions, deſerve all the reſpect due to genius: they are of the number of thoſe men whom nature, ſparing of her beſt gifts, grants but occaſionally to the inhabitants of the earth. If they are ſublime, they elevate the human race; if they are agreeable only, they excite thoſe ſweet ſenſations neceſſary to our happineſs.

In laying before our readers a ſuccinct account of this noble art, we ſhall, firſt, give the hiſtory of painting, including its riſe, progreſs, and decline, in ancient and modern times; an account of the ſchools, and of the different merits of painters; and a compariſon between the ancient and modern painting. Secondly, we ſhall lay down the principles of the art, and the order in which the artiſt conducts his ſtudies. Thirdly, we ſhall enumerate the different claſſes of painting, with obſervations on each. And, Fourthly, we ſhall treat of œconomical or houſe-painting.

HISTORY.

SECT. I. *Riſe, Progreſs, and Decline of Painting in Ancient and Modern Times.*

It is to be imagined that men muſt naturally, and very early, have conceived an idea of the firſt principles of the art of painting; the ſhadow of each plant and animal, and of every object in nature, muſt have afforded them the means of conceiving, and pointed out the poſſibility of imitating, the figures of all bodies. Thus the ſavage nations, an emblem of what men were in the infancy of ſociety, poſſeſs the firſt rudiments of this art, even before thoſe which are uſeful and almoſt neceſſary to exiſtence; their naked bodies are covered with punctures of various forms, into which they infuſe indelible colours. The next demand for this art, is to preſerve the memory of warlike exploits. It is more natural to form ſome repreſentation of an action, than to give an account of it by means of arbitrary characters. Hence the picture-writing of the Mexicans, and the more artful hieroglyphics of Egypt.

Painting conſiſted of ſimple outlines long before the expreſſion of relievo or the application of colour. It was ſimply drawing; and the maſter-pieces of painting in that rude period were not ſuperior to the ſports of children. Although occupied about a ſingle point, it was not brought to perfection; for conſtant experience inſtructs us that men never excel in the inferior parts of an art till they are capable of carrying the whole to perfection.

After employing for a long time thoſe ſimple outlines, the next ſtep in the art of painting was to make the imitation more complete, by applying colours: this was firſt accompliſhed by covering the different parts of the figure with different colours in the ſame way that we colour maps; and ſeveral nations, as the Egyptians, the Chineſe, and the different nations of India, have never painted in a better manner. Other nations, more ingenious and more attentive to the arts, obſerving that the objects of nature have relievo, have invented what is called *claro-obſcuro*. The Greeks, the moſt ingenious, penetrating, and delicate of all, invented this part antecedent to colours; than which there cannot be a greater proof of their exquiſite taſte, as the glare of colours without judgment excites more admiration in the minds of the vulgar and ignorant, than the camaieu or drawings of one colour executed by the moſt ſkilful artiſt.

Theſe general obſervations concerning the gradual improvement of this art, will be beſt illuſtrated by a more particular attention to the ancient nations in which it flouriſhed.

Painting among the Egyptians.

Plato, who lived 400 years before the Chriſtian era, informs us that painting had been practiſed in Egypt for ten thouſand years; that ſome of the productions of that high antiquity were in exiſtence; and that they bore an exact reſemblance to thoſe which the Egyptians executed in his time. Without regarding the period of ten thouſand years mentioned by Plato, it is reaſonable to conſider it as an indeterminate period, which carries us back to very remote antiquity.

The figures either in the painting or ſculpture of Egypt were extremely ſtiff; the legs were drawn together, and their arms were paſted to their ſides. It appears that there only model was their mummies, and that their ſkill in anatomy was derived from embalming them. They were extremely incorrect in every part of the head; they placed the ears much higher than the noſe. Beſides, they gave the face the form of a circle inſtead of an oval; the chin was ſhort and rounded; the cheeks exceſſively ſo; and they turned upwards the corners of the mouth and eyes. Many of theſe faults may be aſcribed to the formation of the human face in Egypt; but the placing of the ears could only be founded in caprice or ignorance.

The exactneſs of the Egyptian proportion is much celebrated; but although we grant that they obſerved the proper length of the different parts of the human body, they were ſtill defective artiſts, ſince they did not obſerve the breadth, and were moreover ignorant altogether of the ſhape and ſize of the muſcles. Works converted to religious purpoſes chiefly occupied the Egyptian painters. They had figures for imitation from which they would not depart, and thoſe figures were monſtrous; the bodies of animals with the heads of men; the bodies of men with the heads of animals: or if the figure was more agreeable to nature in its parts, yet it was ſo deformed and imaginary, as to have nothing ſimilar to it as a whole in the creation of God.

The monuments of Egyptian painting with which we are beſt acquainted (ſays Winklemann) are the cheſts of mummies. Theſe works have reſiſted the injuries of time, and are ſtill ſubmitted to the examination of the curious. The white, made of white lead, is ſpread over the ground of the piece; the outlines of the figure are traced with black ſtrokes, and the colours, are four in number; namely, blue, red, yellow, and green, laid on without any mixture or ſhading. The red and blue prevail moſt; and thoſe colours ſeem to have been prepared in the coarſeſt manner. The light is formed by leaving thoſe parts of the ground where it is neceſſary, covered with the white lead, as it is formed by the white paper in ſome of our drawings. This deſcription is ſufficient to convince us that the whole art of painting in Egypt conſiſted in colouring: but every perſon knows, that without tints and the mixture of colours painting can never arrive at great perfection.

In Upper Egypt there ſeems to have exiſted a kind of coloſſian painting, which has never been examined except by travellers who were no great critics in the art. Winklemann had ſome reaſon to expreſs a deſire that thoſe remains of antiquity, with regard to the manner of working, the ſtyle, and the character, had been accurately explored. Walls of 24 feet in height, and pillars of 32 feet in circumference, are wholly covered with thoſe coloſſian figures. According to Norden they are coloured in the ſame manner with the mummies: the colours are applied to a ground prepared in manner of freſco; and they have retained their freſhneſs for many thouſand years. Winklemann adds, that all the efforts of human ſkill and induſtry could

make

makę as little impreſſion on them as the injuries of time. His enthuſiaſm for antiquity has perhaps led him into this extravagant exaggèration.

It appears that the great employment of the Egyptian painters was on earthen veſſels, on drinking cups, in ornamenting barges, and in covering with figures the cheſts of mummies. They painted alſo on cloth; but painting, as an induſtrious occupation, ſuppoſes a workman, not an artiſt: the decoration of temples, houſe-painting, and that of the figures relative to religion, are to be conſidered only in this point of view. The workmen in Ruſſia who paint our Saviour holding the globe in one hand, and bleſſing the people with thę other, are not members of the imperial academy of fine arts.

Pliny informs us that the Egyptian artiſts painted alſo the precious metals; that is to ſay, they varniſhed or enamelled them. It is doubtful what this art was, but moſt probably it conſiſted in covering gold or ſilver with a ſingle colour.

The Egyptians are ſuppoſed to have continued this coarſe ſtyle till the reign of the Ptolemies.

2
In Perſia.

The Perſians were ſo far from excelling in the arts, that the paintings of Egypt were highly eſteemed among them after they had conquered that country.

The carpets of Perſia were in great value in Greece, even in the time of Alexander the Great, and theſe were adorned with various figures; but this is no proof that they were well executed, any more than a demand for ſeveral of the Chineſe productions is at preſent a proof of the taſte of that people in the arts. It was the fabrication of the ſilk, and not the truth of the repreſentation, which made the Greeks admire the carpets of the Perſians.

The Perſians, as well as the Arabians, had ſome knowledge of Moſaic work. This is only valuable when it copies, in a manner that cannot be deſtroyed, the works of a great maſter; but if the Perſians had no good pictures to copy into Moſaic, it was of no conſequence to be able to arrange, in a ſolid manner, pieces of flint one beſide another.

There is only one Perſian painter whoſe name has deſcended to poſterity; and he is preſerved, not becauſe he was a painter, but becauſe he accommodated the ancient doctrine of the two principles to the Chriſtian religion. Beſides, it is doubted whether *Manes* was a Perſian or a Greek, and it is ſtill leſs known whether he was a painter. He is praiſed in Aſia for drawing ſtraight lines without a ruler.

The modern Perſians have made no kind of progreſs in the arts. The emperor Schah abbas, wiſhing from caprice to be inſtructed in drawing, was obliged to have recourſe to a Dutch painter who happened to be in his dominions.

3
In India and Thibet.

The modern Perſians paint on cloth, and the artiſts in India are their rivals in this branch of induſtry; but their paintings are purely capricious. They repreſent plants and flowers which have no exiſtence in nature; and their only merit conſiſts in the brightneſs and the ſtrength of their colours.

Beſides this, the art in India, as it was in the moſt remote antiquity, is confined to monſtrous figures connected with their religion, animals not to be found in the world, and idols with a multitude of arms and heads, which have neither exactneſs in their forms nor proportions. See POLYTHEISM.

The paintings of Thibet diſcover great patience in the artiſt, and are remarkable for the fineneſs of their ſtrokes. Their painters might diſpute with Apelles and Protogenes for extreme tenuity of pencil; but it is in this alone, without any regard to the art, in which their merit conſiſts.

Some of the idols in Thibet are executed in a certain ſtyle of relievo; but thoſe productions are not only imperfect, they are alſo ſo deſtitute of beauty as to forbid every hope of excellence in the art. The ſame thing may be obſerved with regard to many of the eaſtern nations; they ſeem to have that want of ſtyle which would for ever condemn them to mediocrity, even if they ſhould happen to arrive at it.

4
In China.

An obſcure Italian painter named *Giovani Ghirardini*, who travelled into China, whoſe judgment is more to be depended on in an art which he practiſed than that of other travellers, declares that the Chineſe have not the leaſt idea of the fine arts; and this opinion is confirmed by every thing which we know of that people.

The Chineſe ſeem not to have the ſmalleſt conception of perſpective. Their landſcapes have no plan, no variety in the appearance of the clouds, and no diminiſhing of the objects in proportion to their diſtance.

The great object of their painting ſeems to conſiſt in making their figures as unlike nature as poſſible; it is a ſerious caricature of the human figure.

To make the art flouriſh, it is neceſſary that the artiſt be eſteemed and rewarded. In China, there is no artiſt ſo poorly paid as the painter.

The ignorant admire the brightneſs and purity of their colours; but ſimple colours appear always bright and pure: The difficulty of the art conſiſts in melting them into one another in ſuch a manner that the mixture ſhall not be perceived. It muſt at the ſame time be confeſſed, that their natural colours are more brilliant than ours; but if there be any merit in this, it is to be aſcribed to their climate, not to their ability.

A Jeſuit miſſionary, who in his youth had been a grinder of colours, was raiſed to the greateſt eminence as a painter in the Imperial court of China, and Raphael himſelf was never ſo much reſpected. The Chineſe battles ſent from that country to Paris to be engraved, are the work of the Jeſuits; and except they were done by the Chineſe themſelves, it is impoſſible to conceive that they could be worſe executed.

The Chineſe, like other eaſtern nations, have a few ſimple ſtrokes which they repeat in all their variety of figures. In the figures on the earthen ware, they diſcover no knowledge of forms, no expreſſion of the moſt conſpicuous muſcles, and no idea of proportion. And in all the paintings of China, anatomy ſeems to bear no relation to the art. Some heads done by a Chineſe painter have a ſort of reſemblance to nature, but they are in a low and vicious taſte: The fulneſs of the drapery conceals the parts in ſuch a manner that they do not ſeem to exiſt under it. Sculpture in China is in a ſtate of no great perfection, but at the ſame time it is better executed than their paintings.

5 In Etruria. The ancient inhabitants of Etruria, now called *Tuſcany*, were the firſt who connected the arts with the ſtudy of nature. In ſome of their monuments which ſtill remain, there is to be obſerved a firſt ſtyle, which ſhows the art in its infancy; and a ſecond, which, like the works of the Florentine artiſts, ſhows more of greatneſs and exaggeration in the character than preciſion or beauty.

Pliny ſays that painting was carried to great perfection in Italy before the foundation of Rome; perhaps he means in compariſon with the infancy of the art in Greece at that period; but it appears that even in his time the painters of Etruria were held in great reputation.

The only Etrurian paintings which remain, have been found in the tombs of the Tarquins. They conſiſt of long painted frizes, and pilaſters adorned with huge figures, which occupied the whole ſpace from the baſe to the cornice. Theſe paintings are executed on a ground of thick mortar, and many of them are in a ſtate of high preſervation.

6 In Campania. Winklemann is of opinion that the Greek colonies eſtabliſhed at Naples and Nola, had at a very early period cultivated the imitative arts, and taught them to the Campanians eſtabliſhed in the middle of the country. This learned antiquarian conſiders as works purely Campanian, certain medals of Capua and Teanum, cities of Campania into which the Greek colonies never penetrated. The head of a young Hercules, and the head of a Jupiter, according to Winklemann, are executed in the fineſt manner. It is ſtill a queſtion, however, in the learned world, whether theſe medals owe their exiſtence to Carthage or to Campania.

“ But there has been diſcovered (adds Winklemann) a great number of Campanian vaſes covered with painting. The deſign of the greateſt part of theſe vaſes (ſays he) is ſuch, that the figures might occupy a diſtinguiſhed place in a work of Raphael. Thoſe vaſes, when we conſider that this kind of work admits of no correction, and that the ſtroke which forms the outline muſt remain as it is originally traced, are wonderful proofs of the perfection of the art among the ancients.” Winklemann had an opportunity of examining a very fine Campanian vaſe, on which was painted a burleſque repreſentation of the loves of Jupiter and Alcmene. But as this muſt have been derived from ſome fragment of a Grecian comedy, the Count de Caylus is perſuaded that the Campanian vaſes are of Greek origin.

7 Among the Greeks. Although the hiſtory of Greek painting be more fully known than that of the ſame art among the barbarous nations, it is nevertheleſs involved in much obſcurity. Pliny is almoſt the only author who has preſerved the materials of its hiſtory; and he complains, that on this occaſion the Greek writers have not diſcovered their uſual exactneſs. They place, ſays he, the firſt painter of whom they ſpeak in the 90th Olympiad, 424 years before the Chriſtian era. It is certain that painting in dry colours exiſted at the time of the ſiege of Troy, or at leaſt when Homer wrote the account of it The buckler of Achilles is a ſufficient proof that the Greeks were then acquainted with the baſſo-relievo, a kind of ſculpture which bears a near affinity to painting.

In the Iliad, Helen is repreſented as working at a tapeſtry, whereon ſhe figured the numerous combats of which ſhe was the cauſe. When Andromache was informed of her huſband's death, ſhe was occupied in repreſenting on tapeſtry flowers of various colours. From theſe facts, it is certain that painting was not confined to ſimple ſtrokes, nor even to the camaieu; and hence it is reaſonable to conclude, that what is called *linear painting* was practiſed long before the time of Homer. Polygnote of Thaſos, who lived about 420 years before the Chriſtian era, was the firſt painter of any eminence in Greece. Pliny informs us that he was the firſt who clothed his female figures, who varied the colours of the different parts of their dreſs, or who opened their mouths in ſuch a manner as to ſhow their teeth. Ariſtotle, who flouriſhed in a ſubſequent period, allows this painter to have excelled in expreſſion. But the art of painting may be ſtill conſidered in its infancy in Greece, till about 400 years before the Chriſtian era, when Zeuxis and Parrhaſius flouriſhed. In the conteſt between theſe eminent painters, Zeuxis declared himſelf to be overcome, becauſe in a cluſter of grapes which he painted he had deceived the birds; whereas Parrhaſius in a curtain which he executed deceived his rival. The principal works of Zeuxis are his *Penelope*, in which, according to Pliny, he appears to have expreſſed the manners of that princeſs; a Jupiter ſurrounded by the gods; a Hercules ſtrangling the ſerpents in the preſence of Amphitrion and Alcmene; an Helen and a Marſyas bound. From this enumeration of theſe works, and from the fame which they have acquired, it is evident that the difficult parts of the art, and thoſe which in the execution render it eſtimable, were now begun to be ſtudied. By Apelles, Protogenes, and Euphranor, it was carried to the greateſt height of perfection. Grace, and ſymmetry, and proportion, and illuſion, were now added by the greateſt maſters to the nobleſt objects of nature.

8 Among the Romans. We have already ſeen, that before the foundation of Rome the arts were cultivated in Etruria. They were alſo early introduced into Latium; but whether that country employed its own artiſts or thoſe of Etruria, remains altogether uncertain. One need not be aſtoniſhed, that at a period when the arts were in their infancy in Greece, they were raiſing ſtatues to their kings in Rome: but at that period all their artiſts were Etrurians or Latins; and when they conquered Italy, they made all the nations of it as barbarous as they were themſelves.

In the year 259 from the building of the city of Rome, and 494 years before the Chriſtian era, Appius Claudius conſecrated a number of ſhields in the temple of Bellona, which contained in baſſo relievo the portraits of his family. This example was followed; and in proceſs of time it was common among the Romans to place thoſe images in private houſes. The execution in baſſo-relievo is a proof that they had an idea of painting, at leaſt with one colour. As long as the Romans employed artiſts of other nations, they had little deſire to cultivate the arts; but towards the year of Rome 450, and 303 years before Chriſt, one of the Fabii thought it no diſcredit to a noble family to employ himſelf in painting. He painted the temple of Safety; and his works remained ed till that temple was deſtroyed by fire, in the reign of Claudius. It is worthy of remark, that the ſame man was the firſt painter and the firſt hiſtorian in his country.

The example of Fabius, ſurnamed *Pictor* from his profeſſion, did not excite his fellow citizens to imitation. A century and a half elapſed before the tragic poet Pacuvius, nephew of Ennius, painted the temple of Hercules in the *forum boarium*. The glory which he had acquired by his dramatic works ſhed ſome luſtre on the art, which he condeſcended to exerciſe; but did not confer on it that reſpect which could recommend it to general practice. The paintings of Fabius were the works or rather the recreations of his youth; thoſe of Pacuvius, the amuſements of his old age; but painting is a difficult art, which requires the whole attention, and which can never be proſecuted with ſucceſs, except thoſe who love it are ſolely devoted to the performance.

It appears that there were no eminent painters at Rome till the time of the emperors; but as the national ſpirit was changed, the profeſſion of the fine arts acquired more reſpectability. The Romans, during the time of the republic, were animated with the ſpirit of liberty and the deſire for conqueſt. When theſe two paſſions were weakened, the love of the arts obtained among them. As a proof of this it is ſufficient to ſay, that Nero himſelf gloried in being an artiſt. A Coloſſian picture of 120 feet was painted at Rome by the command of this emperor, which was afterward deſtroyed by lightning. The name of the painter is not recorded, and there are various opinions concerning the merit of the performance; but the thing chiefly worthy of obſervation is, that this is the only painting on cloth mentioned by ancient authors.

9
Of the modes of painting among the ancients.

The paintings of the ancient artiſts were either moveable or on the ceilings or compartments of buildings. According to Pliny, the moſt eminent were thoſe who painted moveable pictures. The latter were either on fir-wood, larch, boxwood, or canvas, as in the coloſſian picture mentioned above, and ſometimes on marble. When they employed wood, they laid on in the firſt inſtance a white ground. Among the antiquities of the Herculaneum are four paintings on white marble.

Their immoveable paintings on walls were either in freſco or on the dry ſtucco in diſtemper. Indeed all the ancient paintings may be reduced to, *firſt*, freſco painting; *ſecondly*, water-colour or diſtemper painting on a dry ground; and, *thirdly*, encauſtic painting.

The ancient freſco-paintings appear to have been always on a white ſtucco-ground, the colours inlaid very deep, and the drawing much more bold and free than any ſimilar performance of modern art. The outlines of the ancient paintings on freſco were probably done at once, as appears from the depth of the inciſion and the boldneſs and freedom of the deſign, equal to the care and ſpirit of a pencilled outline.

In general the ancients painted on a dry ground, even in their buildings, as appears from the Herculanenan antiquities, moſt of which are executed in this manner. At Rome and Naples, the firſt (deepeſt) coat is of true Puzzolana, of the ſame nature with the *terras* now uſed in mortar, required to keep out wet, about one finger thick; the next of ground marble or alabaſter, and ſometimes of pure lime or ſtucco, in thickneſs about one third of the former. Upon this they appear to have laid a coat of black, and then another of red paint; on which laſt the ſubject itſelf was executed. Such ſeems to have been their method of painting on walls; but in their moveable pictures, and in the performance of their firſt artiſts, and where effect of ſhade and light were neceſſary, they doubtleſs uſed white.

The colours employed they ſeem to have mixed up with ſize, of which they preferred that made by boiling the ears and genitals of bulls. This appears to have made the colours ſo durable and adheſive, that the ancient paintings lately found bear waſhing with a ſoft cloth and water; and ſometimes even diluted aquafortis is employed to clean their paintings on freſco. Pliny ſays that glue diſſolved in vinegar and then dried, is not again ſoluble.

What the encauſtic painting of the ancients was, has been much diſputed. From the works of Vitruvius and Pliny, it appears evidently that it was of three kinds.

Firſt, where a picture painted in the common way, was covered with a varniſh of wax melted, diluted with a little oil, and laid on warm with a bruſh.

Secondly, where the colours themſelves were mixed up with melted wax, and the mixture uſed while warm. And,

Thirdly, where a painting was executed on ivory by means of the *ceſtrum* or *viriculum*.

Some experiments on this laſt method by Mr Colebrook may be found in the Phil. Tranſ. vol. 51. and more particular directions in Muntz's Treatiſe on Encauſtic Painting.

It appears from ancient writings of the beſt authority, that in the earlieſt and pureſt times of this art, the painters uſed few colours, perhaps not more than four. "The paintings of the ancients (ſays Dionyſius Halicarnaſſeus) were ſimple and unvaried in their colouring, but correct in their drawing, and diſtinguiſhed by their elegance. Thoſe which ſucceeded, leſs correct in their drawing, were more finiſhed, more varied in their light and ſhades, truſting their effect to the multitude of their colours." But no certain concluſion can be drawn, that the more early among the great painters of the ancients, ſuch as Apollodorus, Zeuxis, Timanthes, &c. had no more colours than four to uſe, merely becauſe they did not uſe them. On the contrary, it may be conjectured with ſome degree of probability, from their chaſteneſs in deſign, and from the complaints Pliny makes of the gaudy taſte of the Roman painters, that the Greeks in general were *deſignedly* chaſte in their colouring, and not ſo merely from neceſſity, at leaſt about the time of Zeuxis and Apelles; for the former could not have painted grapes ſo naturally as he is ſaid to have done with four colours only: and the rebuke given by the latter to one of his ſcholars who had painted an Helen very gaudily, is a confirmation of theſe obſervations. "Young man (ſays Apelles), not being able to make her beautiful, you have made her rich."

10
The colours uſed by the ancients.

Of white colouring ſubſtances, the ancients had white lead variouſly prepared, a white from calcined egg-ſhells, and preparations from cretaceous and argillaceous earths. The moderns in addition have magiſtery of biſmuth, little uſed; and *ought* to have the calces of tin and zinc.

Of *blacks*, the ancients had preparations ſimilar to lamp, ivory, blue, and Franckfort black; alſo to Indian ink, and common writing ink; and they uſed, what we do not, the pricipitate of the black dyers vats.

The ancients poſſeſſed a ſpecies of *vermilion* or fine cinnabar, a coarſer cinnabar, red lead, various earths burnt and unburnt, apparently ſimilar to our red ochre; Venetian red, Indian red, Spaniſh brown, burnt terra de Sienna, and ſcarlet ochre; they had alſo a ſubſtance alike in colour and in name to our dragon's blood.

The yellow pigments of the ancients were generically the ſame with our operiments, king's-yellow, Naples yellow, &c. They did not poſſeſs turbeth-mineral, mineral yellow, or gamboge; nor do they appear to have known of gall-ſtone as a pigment.

Of blue paints they had preparations from the lapis ſyanus and lapus armenus. Indigo they had, and perhaps bice and ſmelt; for they made blue glaſs, but whether from ſome ore of cobaltor or of wolfram muſt be uncertain: they had not Pruſſian blue, verditer, nor litmus which we have. We do not uſe the blue precipitate of the dyers vats, nor mountain blue, which they certainly employed.

Of green colours they had verdegriſe, terra vert, and malaſhite, or mountain green. The latter is not in uſe among us. Sap green, green verditer, and Scheele's green, appear to have been unknown to them: like us, they procured as many tints as they pleaſed from blues and yellow vegetables.

We have no original *purple* in uſe: that from gold by means of tin, though very good, when well prepared, is too dear perhaps, and unneceſſary. Their purple was a tinged earth. Their orange or ſandarac (red orpiment) we alſo poſſeſs. Hence there does not appear to have been any great want of pigments, or any very material difference between the colours they uſed and ſuch as we generally employ. Perhaps the full effect of colouring may be obtained without the uſe of exceeding brilliant pigments, depending chiefly on the proportion and oppoſition of tints.

VI
Whether the ancients painted in oil.

The ancients could not know any thing about the ſpirit varniſhes, diſtillation being a modern invention; but they were undoubtedly acquainted with the uſe of the better oil varniſhes, that is, with the uſe and effect of reſinous gums diſſolved in boiling inſpiſſated oils.

One of the beſt preſerved mummies in the Britiſh muſeum has an aſtoniſhing brightneſs of colours on the outſide of the coffin. Thouſands of years have not impaired them; they are as freſh as if they had been laid on yeſterday.

The chalk ground, and the excellency of the colours, ſome of which imply a good deal of chemical and metallurgical knowledge, do not ſufficiently account for their ſplendour and freſhneſs: it muſt be owing to other circumſtances; either to the mixture of ſhining colours, or to a hard gloſſy ſkin, which viſibly covers them all over.

From an accurate examination of one of thoſe mummies belonging to the univerſity of Cambridge, it appeared, that the varniſh which covered the colours could not be diſſolved, or in the leaſt affected by common water; and that it equally reſiſted the diſſolving power of the ſtrongeſt ſpirits: hence it is reaſonable to conclude that the coffins of the mummies were not covered with ſize, whites of eggs, ſimple gums, or any preparation of wax, but with a fine tranſparent oil varniſh. It was diſcovered at the ſame time, that the colours themſelves were not prepared or mixed with oil; for where the external gloſſy ſkin was damaged, broken, or rubbed off, even common water would waſh the colours away, and affect the chalk ground under them.

Pliny has deſcribed the general and particular effects of the varniſh of Apelles, under the name of *atrament*, ſo diſtinctly, that nobody can diſtinguiſh the thing or the mixture he is ſpeaking of. He has mentioned the ſhining gloſſy ſkin of the varniſh which excites the brightneſs of the colours, and preſerves them againſt duſt; he obſerved, that this ſkin was laid on ſo thin, that it could not be diſcerned at any diſtance: nor was he leſs accurate in reporting the particular effects of that mixture which Apelles made uſe of; it harmonized and lowered the tone of the brighteſt florid colours in an imperceptible manner, and the whole appeared as if it had been ſeen through iſinglaſs. The chemiſts and connoiſſeurs are fully of opinion, that no liquid ſubſtance or mixture of any kind is fit to produce theſe effects beſides the oil varniſhes: and if there are not, Apelles and the Greeks were certainly acquainted with thoſe varniſhes: a fact which might be ſtrongly urged in behalf of their knowledge of oil colours.

The black outlines of the figures on the moſt ancient Greek paintings yet extant, that is, on Etruſcan vaſes, are ſo ſharp, ſo thick, and drawn in ſo eaſy and maſterly a manner, that one cannot help looking upon them as having been drawn in oil colours. Had they been in diſtemper or water colours on the red clay ground on which they are applied, they would have been imbibed and ſoaked into it. Our china and enamel painters prepare and apply their colours with ſpike or other liquid oils; and the Greek maſters ſeem to have done the ſame, unleſs they ſhould appear to have burnt their vaſes before they painted them, or to have uſed a mixture of diſſolved wax or gum for giving a body to their colours, which might have anſwered the ſame end as oils. And this is the more probable, as there is ſome reaſon to believe that theſe vaſes went through two different fires, that of baking them, and that of ſmelting or burning in their colours.

The Greek and Roman paintings that have been preſerved or diſcovered at Rome and Herculaneum do not countenance the ſuppoſition of oil colours; at leaſt Turnbull and the academiſts at Naples, who have deſcribed the royal collection at Portici, Cochin, and many other authors who have ſeen and deſcribed them, do not hint any thing of that nature. On the other hand, Vitruvius, who has left us ſo many valuable notices of the ancient arts, acquaints us, that there was a kind of painting which abſolutely required a mixture of oil: And Pliny, to the ſame purpoſe, expreſsly ſays, "Sun and moon ſhine are inimical and obnoxious to red lead. The remedy is to apply the red wax when hot and melted *with ſome oil* on the well dried walls which is to be done with bruſhes."

From theſe obſervations, the evidence which the ancients have given us in behalf of themſelves, and of their knowledge of oil painting, may be ſummed up in few words.

Their having been acquainted with the white chalk ground, which many modern maſters have uſed for oil painting on boards, proves no more than that the ancients might have done the ſame.

The oil varniſhes uſed by the Egyptians and by Apelles might have brought them to the diſcovery of oil painting; but as it appears both from mummies and from the works of Pliny, that their colours were not prepared and mixed with that varniſh, and as it is plain rather that this varniſh was externally laid over the finiſhed pictures; no other concluſion can be drawn, except that they were within ſight of the diſcovery, and that it is a matter of wonder that they ſhould not have laid hold of it.

The outlines of the old Greek or Etruſcan vaſes are merely fallacious appearances.

The old Greek and Roman paintings on walls and ſtones are either painted in diſtemper and freſco, or they have not been ſufficiently examined.

The oil uſed in the coarſer wax and wall paintings proves at moſt that experiments had been tried with oils; but we have no direct proofs of oil painting having been underſtood or uſed by the Egyptians, Greeks, or Romans; and that, however great their ſkill or ingenuity, they might very well have been within ſight and reach of the diſcovery, and nevertheleſs have miſſed it.

12
Riſe, progreſs, and decline, of modern painting.

The art of painting was revived in Europe about the end of the 13th or beginning of the 14th century. The human mind, however, plunged in profound ignorance, was deſtitute of every principle of ſound philoſophy which might enable it to determine on the objects of the arts; and of conſequence the painters contented themſelves with works adapted to the general taſte, without beauty and without proportion. In Italy, where the firſt attempts were made, they were employed in repreſenting the myſteries of the *paſſion*, and ſubjects of a ſimilar nature, on the walls of chapels and churches. Their labours were directed to a vaſt number of figures, rather than to the beauty and perfection of each; and the art in more modern times has always preſerved ſomewhat of this abſurd fault which it contracted at that early period. The artiſt in our times is not, like thoſe in Greece, at liberty to devote his talents only to men of knowledge and diſcernment; he is conſtrained to pleaſe thoſe who are rich, and very frequently thoſe who are ignorant. Inſtead of propoſing to himſelf the perfection of the art as the great object of his purſuit, he muſt reſt his ſucceſs and character on the facility of his operation and the abundance of his works.

Painting did not long continue in the imperfect condition in which it was left by thoſe who firſt cultivated it among the moderns. It was natural that their ſucceſſors ſhould endeavour to ſurpaſs them by joining ſome degree of theory to the barbarous practice they had adopted. The firſt thing which they diſcovered, or rather which they revived after the manner of the ancients, was perſpective. This made the artiſts capable of expreſſing what is called *foreſhortening*, and of giving more effect and more truth to their works.

Dominique Ghirlandaios, a Florentine, was the firſt who enriched the ſtyle of his compoſition by grouping his figures, and who gave depth to his pictures, by diſtinguiſhing, by exact gradations, the ſpaces which his figures occupied; but his ſucceſſors have far ſurpaſſed him in boldneſs of compoſition.

Leonard da Vinci, Michael Angelo, Giorgian, Titian, Bartholemew de St Marc, and Raphael, flouriſhed about the end of the 14th century. Leonard da Vinci was the inventor of a great many details in the art: Michael Angelo, by ſtudying the ancients, and by his knowledge of anatomy, arrived at great elegance in drawing the outlines of his figures: Giorgion enriched the art in general, and gave greater brilliancy to his colours than his predeceſſors: Titian, by a careful imitation of nature, made great proficiency in the truth and perfection of his tones: Bartholemew de St Marc ſtudied particularly the part of drapery, and diſcovered the claro obſcuro, the beſt manner of giving drapery to his figures, and of making the naked to be felt even where they were covered: Raphael, endowed with a ſuperior genius, began with ſtudying carefully all his predeceſſors and all his contemporaries. He united in himſelf all the excellencies which they poſſeſſed; and formed a ſtyle more perfect and more univerſal than any painter who went before or who has ſucceeded him. But while he excelled in every part of the art, he was chiefly ſuperior in thoſe of invention and of compoſition. It is probable that the Greeks themſelves would have been filled with admiration if they had beheld his chief pieces in the Vatican, where to the greateſt abundance of paintings is joined ſo much perfection, and purity, and eaſe

After painting had arrived at the greateſt perfection among the Greeks by the exertions of Zeuxis and Parrhaſius, Apelles found nothing to add to the art except grace; in the ſame manner among the moderns, after Raphael had appeared, grace was the only thing wanting to the art, and Corregio became the Apelles of Europe. Painting was by him carried to the higheſt degree among the moderns; the taſte of the beſt critics and the eye of the vulgar were equally gratified.

After theſe great maſters a conſiderable interval elapſed till the time of the Caracci. Thoſe artiſts, born at Bologna, by ſtudying the works of their predeceſſors with great care, and particularly thoſe of Corregio, became the firſt and the moſt celebrated of their imitators. Hannibal poſſeſſed a very correct deſign, and united ſomewhat of the ancient ſtyle to that of Lewis his brother; but he neglected to inquire into the intricate principles and philoſophy of the art. The pupils of the Caracci formed a ſchool after their manner; but Guido, a painter of an eaſy and happy talent, formed a ſtyle altogether graceful, and rich, and eaſy. Guerſhen formed after Caravaggio, or invented himſelf a particular ſtyle of the claro-obſcuro, compoſed of ſtrong ſhades and vivid oppoſitions.

Peter de Cortone ſucceeded thoſe great imitators of their predeceſſors and of nature; who finding it difficult to ſucceed in that kind of painting, and having beſides great natural abilities, applied himſelf chiefly to compoſition or arrangement, and to what the artiſts call taſte. He diſtinguiſhed invention from compoſition; appeared not to have attended to the former, but chiefly to thoſe parts which are moſt prominent in the picture, and to the contraſting of groups. It was then that the practice was introduced of loading pictures with a great number of figures, without examining whether or not they agreed to the ſubject of the hiſtory. The ancient Greeks employed a very ſmall number of figures in their works, in order to make the perfection of thoſe which they admitted more evident. The diſciples or imitators of Cortona, on the other hand, have ſought to conceal their imperfections by multiplying their figures. This ſchool of Cortona is divided into many branches, and has changed the character of the art. The multiplication of figures, without a judicious and proper choice, carried back the art of painting to that point where the firſt reſtorers of it among the moderns had left it; while at the ſame time the diſciples of Cortona were enabled to give to this firſt condition of the art a greater degree of perfection than the firſt artiſts.

About the middle of the 17th century flouriſhed at Rome Carlo Maratti, who, aiming at the greateſt perfection, carefully ſtudied the works of the firſt painters, and particularly thoſe of the ſchool of the Caracci. Although he had already ſtudied nature, he diſcovered by the works of theſe artiſts that it is not always proper to imitate her with a ſcrupulous exactneſs. This principle, which he extended to every part of the art, gave to his ſchool a certain ſtyle of carefulneſs, which however is conſiderably degenerated.

France has alſo produced great maſters, particularly in the part of compoſition; in which Pouſſin, after Raphael, is the beſt imitator of the ſtyle of the ancient Greeks. Charles le Brun and many others diſtinguiſhed themſelves for great fertility of genius: and as long as the French ſchool departed not from the principles of the Italian ſchool, it produced maſters of great merit in the different branches of the art.

Mengs, from whom this account is taken, is not deceived when he declares the art of painting to have degenerated in France after Le Brun; but he ſeems to be miſtaken in giving the imitation of the works of Rubens found at Paris as the cauſe of this decay. It appears from this opinion, that the recent French ſchool was not well known to him. The French, indeed, if we may believe their own authors, were never much occupied in the imitation of Rubens; and they have for a long time deſpiſed him. But the perfection of the dramatic art in France, the dreſs of their actors, the magnificence and manners of the court, have contributed very much to the decay of painting. Inſtead of forming their taſte on the beautiful ſimplicity of nature, their painters ſtudied the geſtures and the attitudes of comedians, the fopperies of women of faſhion, the affected airs of courtiers, the pageantry of Verſailles, and the magnificence of the opera. Mengs ſays, "that the French have formed a national ſtyle, of which ingenuity and what they call *eſprit* are the diſcriminating qualities; that they have ceaſed to introduce Greek, Egyptian, Roman, or barbarian perſonages into their paintings; and that, after the example of Pouſſin, they content themſelves with figures altogether French, as if it were their intention to hand down to poſterity that ſuch a nation once exiſted."

Since, according to the confeſſion of Mengs, their figures are altogether French, there is no reaſon to believe that the French painters have imitated Rubens, whoſe works are marked much more ſtrongly than thoſe of his maſter Æneus with the Flemiſh character. The truth is, that their painters, like Cortona and Maratti, have crowded their pictures with a great number of figures; have grouped them in a manner moſt calculated to ſtrike the ſenſes, or have been more intent on agreeable artifices than expreſſion and beauty; and, finally, that they have borrowed the manners of the court and theatre.

The firſt maſters of the great ſchools of painting, with the ancients and nature for their guides, and their genius for their ſupport, carried every part of the art to the greateſt height of perfection. Thoſe who followed them, and who had the example of their predeceſſors in addition to the firſt ſources of truth and beauty, did by no means arrive at the ſame excellence. The Caraccis in their ſchool, Paul Veroneſe, and all the painters of his time, Vandyke, and all thoſe who exerciſed the art in Italy, in Flanders, and in France, ſupported it with great brilliancy. But ſoon after the number of artiſts was multiplied; and ſlaviſhly copying men of inferior talents, they produced works of an inferior nature. Some wanting to be colouriſts, their pieces were exaggerated; others affecting ſimplicity, became cold and inſipid. At this period of the art, men of real abilities, and covetous of fame, who wiſhed to riſe ſuperior to the mediocrity of the times, ſeem not to have taken the road of truth and nature. They affected a ſtyle of pompous preparation, and annexed a kind of merit to the expert management of the pencil. The affected forms of Cortona and of his pupils, the fantaſtical attitudes and the poignant effects of Piazetta, and in ſhort the ingenious contrivances of the laſt maſters of the French ſchool, are decided proofs of this increaſing bad taſte.

It appears, that for ſome time paſt greater pains has been taken to form men for the art than to encourage thoſe who poſſeſs the talent. In conſequence of this ruinous practice, ſchools for drawing, very different from thoſe formed by able painters, have been exceedingly multiplied; and theſe give the elements according to an uniform ſyſtem, by which the mind is laid under a regular reſtraint at the very threſhold of the profeſſion. This evil is productive of two inconveniences; it gives middling painters, and it multiplies them to that degree, as to haſten the downfal and bring into contempt the art itſelf.

The particular reputation of the Italian painters furniſhes another reaſon for the decline of the art. The firſt painters of that country were few in number; they were honoured, and they deſerved to be honoured. Their diſtinguiſhed reputation has conferred a value on the general paintings of their countrymen. The deſire of poſſeſſing taſte, or of being thought to poſſeſs it, has led the rich and the ignorant of all nations to give a preference to the Italian market. Neceſſity, in this caſe, would multiply the painters; and their abilities muſt bear a pretty exact proportion to the diſcrimination of thoſe who give the price.

The decline of painting has alſo ariſen from the deſpotiſm which for ſome time reigned in the academic ſocieties. In fact, theſe have often been ruled by men who would force every exertion of genius into their peculiar tract of operation. If they required ſuch or ſuch merit of execution, the firſt principles of the art were neglected for that peculiar excellency. In this manner the ſchools were abſolute in behalf of deſign as long as ſtatuary was held in chief eſtimation. The artiſt, whoſe abilities and inclination led him to colouring, was obliged to abandon a purſuit which could be of no ſervice to him, and devote himſelf to that for which he was not qualified by nature. On the other hand, if the inſtructions of the ſchools be confined to colouring, a mind diſpoſed to the choice and exactneſs of forms will find no encouragement, and be for ever loſt to the art. In this manner the ignorance of thoſe who wiſh to be connoiſſeurs, and the narrow views of thoſe who pretend to direct the general taſte, have equally contributed to the decline of the arts.

Sect. II. *Of the Schools.*

A School, in the fine arts, denominates a claſs of artiſts who have learned their art from a certain maſter, either by receiving his inſtructions, or by ſtudying his works; and who of conſequence diſcover more or leſs of his manner, from the deſire of imitation, or from the habit of adopting his principles.

All the painters which Europe has produced ſince the renovation of the arts are claſſed under the following ſchools: the ſchool of Florence, the ſchool of Rome, the ſchool of Venice, the Lombard ſchool, the French ſchool, the German ſchool, the Flemiſh ſchool, the Dutch ſchool, and the Engliſh ſchool.

13 School of Florence. This ſchool is remarkable for greatneſs; for attitudes ſeemingly in motion; for a certain dark ſeverity; for an expreſſion of ſtrength, by which grace perhaps is excluded; and for a character of deſign approaching to the gigantic. The productions of this ſchool may be conſidered as overcharged; but it cannot be denied that they poſſeſs an ideal majeſty, which elevates human nature above mortality. The Tuſcan artiſts, ſatisfied with commanding the admiration, ſeem to have conſidered the art of pleaſing as beneath their notice.

This ſchool has an indiſputable title to the veneration of all the lovers of the arts, as the firſt in Italy which cultivated them.

Painting, which had languiſhed from the deſtruction of the Roman empire, was revived by Cimabue, born of a noble family in Florence in the year 1240. This painter tranſlated the poor remains of the art from a Greek artiſt or two into his own country. His works, as may eaſily be imagined, were in a very ordinary ſtyle, but they received the applauſe and admiration of his fellow-citizens; and if Cimabue had not found admirers, Florence in all probability would not have been honoured with Michael Angelo. The number of painters became ſoon ſo conſiderable in Florence, that in the year 1350 they eſtabliſhed a ſociety under the protection of St Luke.

Maſſolino, towards the beginning of the 15th century, gave more grandeur to his figures, adjuſted their dreſs better, and ſhed over them a kind of life and expreſſion. He was ſurpaſſed by Maſſacio his pupil; who firſt gave force, animation, and relievo to his works.

Andrew Caſtagna was the firſt Florentine who painted in oil. But Leonardo da Vinci and Michael Angelo, contemporary painters, were the glory of the ſchool of Florence. Michael Angelo was ſuperior to Leonardo in grandeur, in boldneſs of conception, and in knowledge of deſign; but Leonardo was ſuperior to him in all the amiable parts of the art. Leonardo, poſſeſſed of a fine imagination, and full of ſenſibility, devoted himſelf in painting to expreſs the affections of the ſoul; and if, in this ſublime branch of the art, he was afterwards ſurpaſſed by Raphael, he had at leaſt the glory not only of exceeding all the painters who went before him, but of purſuing a path which none of them had attempted. His deſign was pure and neat, and not wholly deſtitute of greatneſs. He never went beyond nature, and he made a good choice of objects for imitation.

Michael Angelo, leſs formed to experience ſweet affections than vehement paſſions, ſought in nature what the ſtrength of man might accompliſh, not that which conſtitutes beauty. He delighted in being great and terrible, more than in graceful and pleaſant attitudes. Well acquainted with anatomy, he knew more exactly than any other artiſt in what manner to expreſs the joining of the bones of the body, and the office and inſertion of the muſcles; but too eager to diſplay his knowledge of anatomy, he ſeems to have forgotten that the muſcles are ſoftened by the ſkin which covers them; and that they are leſs viſible in children, in women, and in young men, than in confirmed and vigorous manhood. "In his figures (ſays Mengs) the articulations of the muſcles are ſo eaſy and free, that they appear to be made for the attitude in which he repreſents them. The fleſhy parts are too much rounded, and the muſcles are in general too large, and of too equal ſtrength. You never perceive in his figures a muſcle at reſt; and although he knew admirably well how to place them, their action is very frequently inconſiſtent with their ſituation."

"He did not poſſeſs (ſays Sir Joſhua Reynolds) ſo many delightful parts of the art as Raphael; but thoſe which he had acquired were of a more ſublime nature. He ſaw in painting little more than what might be attained in ſculpture; and he confined it to exactneſs of form and the expreſſion of paſſions."

He informs us, in one of his letters, that he modelled in earth or wax all the figures which he intended to paint. This method was familiar to the great painters of his time, and ought never to be abandoned. It appears, that in repreſenting them in this manner in relievo, the painter can imitate them much more exactly than when they are drawn with a crayon or pencil on a plain ſurface.

"Michael Angelo (continues Sir Joſhua Reynolds) never attempted the leſſer elegancies and graces in the art. Vaſari ſays, he never painted but one picture in oil; and reſolved never to paint another, ſaying it was an employment only fit for women and children.

"If any man had a right to look down upon the lower accompliſhments as beneath his attention, it was certainly Michael Angelo; nor can it be thought ſtrange, that ſuch a mind ſhould have ſlighted, or have been with-held from paying due attention to all thoſe graces and embelliſhments of art which have diffuſed ſuch luſtre over the works of other painters."

14
Roman
School.

Ancient Rome, rich with the works brought from Greece, or finiſhed in its own boſom by Grecian artiſts, handed down in its ruins the remains of that glory to which it had been elevated. It was by the ſtudy of theſe remains that the modern artiſts were formed: they derived from them the knowledge of deſign, the beauty of exquiſite forms, greatneſs of ſtyle, and juſtneſs of expreſſion, carried to that length only which did not affect the beauty of the figure. From them alſo they derived the principles of the art of drapery; and they followed theſe principles even while they made the drapery of modern paintings more large and flowing than what was practiſed by the ancient ſculptors. The Roman ſchool was altogether devoted to the principal parts of the art, to thoſe which require genius and vaſt conceptions; and was no farther occupied with colours than what was neceſſary to eſtabliſh a difference between painting and ſculpture, or rather between painting varied with colours and in claro-obſcuro.

Raphael Sanzio, born at Urbino in 1483, and ſcholar to Pietro Perugeno, was the undoubted founder of this ſchool. His firſt manner was that of Perugeno his maſter; but he travelled twice to Florence to ſtudy the great artiſts who flouriſhed in that city.

It was fortunate for Raphael, ſays Mengs, that he was born, in what he terms the infancy of the art, and that he formed himſelf by copying nature before he had acceſs to ſee the works of any great maſter. He began by ſtudying, with great exactneſs, the ſimple truth in his figures. He was then ignorant that any choice was neceſſary; but he ſaw the works of Leonardo da Vinci, of Maſſacio, and of Michael Angelo, which gave his genius a new direction. After this he perceived that there was ſomething more in the art of painting than a ſimple imitation of truth. But the works of thoſe maſters were not ſufficiently perfect to point out the beſt choice to make; and he continued in uncertainty till he ſaw at Rome the works of the ancients. Then he perceived that he had found the true models which he wanted; and in imitating them he had only to follow the natural impulſe of his genius.

Habituated by his firſt manner to imitate nature with preciſion, it was not difficult to carry the ſame exactneſs into the imitation of the ancients; and it was a great advantage to him that he flouriſhed in an age wherein the artiſts were not arrived at facility of execution at the expence of rigorous exactneſs. He never loſt ſight of nature; but he was inſtructed by the ancients in what manner ſhe ſhould be ſtudied. He perceived, that the Greeks had not entered into minute details, that they had ſelected what was great or beautiful, and that one of the chief cauſes of the beauty of their works was the regularity of their proportions: he began, therefore, by carefully ſtudying this part of the art. He ſaw alſo that the joinings of the bones, and the free play of their articulations, are the cauſes of all graceful movement: he therefore, after the example of the ancients, gave the greateſt attention to this part, and was led by theſe obſervations not to be contented with the ſimple imitation of nature.

His deſign is excellent, but neither ſo perfect nor ſo finiſhed as that of the Greeks. He excelled in repreſenting the character of philoſophers, apoſtles, and othe figures of that kind; but he did not equal the Greeks in ideal figures, which ought to carry the impreſſion of divinity. His taſte for deſign was more Roman than Greek, becauſe he formed it chiefly on the baſſo-relievos which he found at Rome. On this account he had the habit of marking ſtrongly the bones and the articulations, and labouring the fleſhy parts leſs; but as theſe baſſo-relievos are very exact with regard to the reciprocal proportions of every member, he excelled in this part, while at the ſame time he did not give to his figures all the elegance of the Greek artiſts, nor the flexibility of articulation which is admired in the Laocoon, in the Apollo of Belvidere, and in the Gladiator.

The manners and ſpirit of his age, and the ſubjects which he moſt commonly treated, prevented him from reaching the ideal of the ancients. Having ſeldom occaſion to repreſent figures altogether ideal, he devoted himſelf to purity of expreſſion. He knew that the expreſſion of the paſſions of the ſoul is abſolutely neceſſary in an art which repreſents the actions of men, ſince from thoſe affections the actions may be ſaid truly to originate. To make figures act, and yet neglect the interior ſprings of action, is nothing more than a repreſentation of automata. The attitudes and action are evident; but they appear not to act of themſelves, becauſe they are void of thoſe principles from which alone men are ſuppoſed to act. An artiſt who neglects expreſſion, gives no juſt repreſentation of character, even though he ſhould take nature for his model.

Raphael's firſt care, when he wanted to compoſe a piece, was to weigh the expreſſion; that is to ſay, to eſtabliſh, according to the nature of the ſubject, the paſſions which were to animate the characters. All the figures, all the acceſſories, all the parts of the compoſition, were moulded to the general expreſſion.

As he had not found examples in the ancient ſtatues of the claro-obſcuro, he was comparatively weak in this part; and if there was any thing remarkable in his diſtribution of light and ſhade, he owed it to the works of the Florentine painters. It cannot be ſaid, however, even with regard to the claro-obſcuro, that he imitated nature without taſte. He delighted in what are called *maſſes* of light; and diſpoſed the great lights in the moſt conſpicuous places of his figures, whether naked or in drapery. If this method did not produce effects highly illuſive, it gives his works that diſtinctneſs which makes his figures conſpicuous at a diſtance; and this muſt be allowed to be an eſſential part of the art of painting. He did not proceed beyond this; and content with that kind of claro-obſcuro which comprehends imitation, he never attempted that which is ideal.

The compoſition and the *enſemble* of his figures were the chief excellencies of Raphael. His philoſophical mind could not be affected with objects which had not expreſſion. He had too high an idea of painting to conſider it as a mute art; he made it ſpeak to the heart and ſoul: and he could only do this in ſubjects which required expreſſion. If Raphael did not reach the Greek excellence, if he did not poſſeſs the art of embelliſhing nature in the ſame high degree, he ſaw at leaſt, and imitated her in whatever was expreſſive and beautiful. "The Greeks ſailed with majeſty (ſays Mengs) between earth and heaven: Raphael walked with propriety on the earth."

"Compoſition is in general (ſays the ſame author) of two kinds: Raphael's is the expreſſive kind; the other is the theatrical or picturesque, which conſiſts of an agreeable diſpoſition of the figures. Lanfranc was the inventor of this laſt, and after him Pietro de Cortona. I give the preference to Raphael; becauſe reaſon preſides over all his works, or at leaſt the greateſt part of them. He never allowed himſelf in common ideas, and was never allured to give any thing in his acceſſory figures which might turn the attention from the principal object of the piece."

A hiſtory of the ſchools is nothing more than a hiſtory of the painters who founded them. In thoſe two which we have already given, Michael Angelo and Raphael come readily forward to claim our attention; and therefore we cannot do better than conclude the account by the maſterly contraſt of theſe eminent painters given by Sir Joſhua Reynolds. "If we put thoſe great artiſts (ſays he) in a light of compariſon with each other, Raphael had more taſte and fancy, Michael Angelo more genius and imagination. The one excelled in beauty, the other in energy. Michael Angelo has more of the poetical in operation; his ideas are vaſt and ſublime; his people are a ſuperior order of beings; there is nothing about them, nothing in the air of their actions, or their attitudes, or the ſtyle and caſt of their limbs or features, that puts one in mind of their belonging to our ſpecies. Raphael's imagination is not ſo elevated; his figures are not ſo much disjointed from our own diminutive race of beings, though his ideas are chaſte, noble, and of great conformity to their ſubjects. Michael Angelo's works have a ſtrong, peculiar, and marked character; they ſeem to proceed from his own mind entirely; and that mind ſo rich and abundant, that he never needed, or ſeemed to diſdain, to look abroad for foreign help. Raphael's materials are generally borrowed, though the noble ſtructure is his own. The excellency of this extraordinary man lay in the propriety, beauty, and majeſty of his characters; his judicious contrivance of compoſition, correctneſs of drawing, purity of taſte, and the ſkilful accommodation of other mens conceptions to his own purpoſe."

15 Venetian ſchool. This ſchool is the child of nature. The Venetian painters not having under their eyes like the Roman the remains of antiquity, were deſtitute of the means of forming a juſt idea of the beauty of forms and of expreſſion. They copied without choice the forms of nature; but they were chiefly delighted with the beauties which preſented themſelves in the mixture and the variety of natural colours. Their attention not being detached from this part by any thing of greater importance, colouring was their chief object, and they ſucceeded in it. They did not reſt contented with characterizing the objects by compariſon, in making the colour proper for one of more value by the colour more proper for another; but they endeavoured ſtill farther, by the agreement and oppoſition of the coloured objects, and by the contraſt of light and ſhade, to produce a vigorous effect, to demand and fix the attention. Dominic, who was ſaid to have periſhed at Florence by the jealouſy of André Caſtagna, and who was the ſecond Italian artiſt who painted in oil, had educated, before he quitted Venice, his native country, Jacques Bellin, who was remarkable for nothing but the picturesque education which he gave to Gentel and John his two ſons.

Gentel, who was the eldeſt, painted chiefly in water colours. John contributed much to the progreſs of his art in painting conſtantly in oil, and after nature. Although he always retained great ſtiffneſs in his manner, he had leſs than his father or brother. Great neatneſs of colouring, and an approach to harmony, are evident in his works. His taſte in deſign is Gothic, the air of his heads is ſufficiently noble, his attitudes are without judgment, and his figures without expreſſion. He had for ſcholars Giorgion and Titian, who deſerve to be conſidered as the founders of the Venetian ſchool.

Giorgion diſtinguiſhed himſelf by a deſign of a better taſte than that of his maſter; but he chiefly ſurpaſſed him in colouring. He died in his 32d year; and excited the emulation of Titian, who ſoon greatly excelled him.

Tiziano Vecelli, known beſt by the name of *Titian*, was inſtructed to copy nature in the moſt ſervile manner in the ſchool of John Bellin; but when he had ſeen the works of Giorgion, he began to ſtudy the ideal in colouring.

The truth of hiſtory is not to be expected in his hiſtorical paintings, or in thoſe of the artiſts of the ſame ſchool. He ſeems to have paid little attention to the conſiſtency of ſcene, to the coſtume, to expreſſion adapted to the ſubject, or, finally, to the accommodation of parts which characteriſe the works of thoſe who have ſtudied the ancients. He was in ſhort a great painter and nothing more.

But although he deſerves not to be placed among the moſt diſtinguiſhed artiſts in point of judgment, yet he is by no means deſtitute of great and noble conceptions. There is often to be found among his male figures a conſiderable degree of grandeur: but if he has ſometimes, like Michael Angelo, overcharged his deſign, it was more diſcovered in the ſwelling of the ſoft and fleſhy parts than in vigour and muſcular ſtrength.

Almoſt entirely devoted to ſimple imitation, he had ſcarcely greater choice in the claro-obſcuro than in deſign. He cannot be juſtly reproached at the ſame time for weakneſs in this particular; becauſe in endeavouring to imitate the colours of nature, he was obliged to obſerve the degrees of light. And in proportion as he ſucceeded in the imitation of natural colours he muſt be leſs defective in the claro obſcuro; but it is not in the knowledge of this part of the art that we are to ſeek for the beauties of his works. Theſe are to be found in the happy diſpoſitions of colours both proper and local, and he carries this to the higheſt point of perfection.

The artiſts in the Florentine and Roman ſchools painted moſt commonly in water colours or in freſco; and in the exerciſe of their profeſſion, inſtead of nature, they finiſhed their works from their firſt ſketches. Titian painted in oil, and finiſhed from the objects in nature; and this practice, joined to his exquiſite talents, gave the greateſt truth to his colours. His being a portrait painter was alſo of advantage to him as a colouriſt. In this department he was accuſtomed to the colours of nature in carnations and draperies. He was a landſcape-painter, and here alſo he took the colours from nature.

"As Titian perceived (ſays Mengs) that the objects which are beautiful in nature have often a bad effect in painting, he found it neceſſary to make a choice in the objects of imitation; and he obſerved, that theſe were objects of which the local colours were extremely beautiful, which nevertheleſs were in a great meaſure deſtroyed by the reflection of light, by the poroſity of the body, and by different luminous tints, &c. He perceived alſo, that in every object there was an infinite number of half tints, which conducted to the knowledge of harmony. In ſhort, he obſerved in the objects of nature, a particular agreement of tranſparency, of opacity, of rudeneſs, and of poliſh, and that all objects differed in the degrees of their tints and their ſhades. It was in this diverſity he ſought the perfection of his art; and in the execution he moderated the effect of natural colours. For example, in a carnation which had many demi-tints, he confined himſelf to one; and he employed even leſs than a demi-tint, where there were few in the natural object. By this means he obtained a colouring exquiſitely fine; and in this part he was a great maſter, and deſerves to be carefully ſtudied."

Titian has in general little expreſſion in his pictures, and he ſometimes introduces figures which augment the coldneſs of the piece; for if it be true that the heads, even in hiſtorical painting, ought to be ſtudied after nature, it is true alſo that an individual nature ought not to be preſented, but one general and ideal. It is neceſſary that they ſhould be men, while they reſemble not men we are accuſtomed to ſee. The painter fails in the effect which he ought to produce, if, when he repreſents Achilles, Hector, and Cæſar, his perſonages are familiar to our obſervation.

The colours of his paintings are ſo mingled together, as to give no idea of the colours on his pallet; which diſtinguiſhes him from Rubens, who placed his colours one at the ſide of another. It is impoſſible to ſay, on the narroweſt inſpection, with what colours he produced his tints. This practice, which enabled him to imitate ſo exactly the colours of nature, gives a marked diſtinction to his manner of painting. In the examination of his works, the critics loſe an ordinary ſource of pleaſure which ariſes from marking the freedom of hand; but they may conſole themſelves with the natural and exquiſite touches of this artiſt.

He is of hiſtorical painters one of thoſe who have ſucceeded in landſcape. His ſituations are well choſen; his trees are varied in their forms, and their foliage well conceived. He had a cuſtom of repreſenting ſome remarkable appearance in his landſcapes to render them more ſtriking.

16 Lombard ſchool.

The diſtinguiſhing characteriſtics of this ſchool are, grace, an agreeable taſte for deſign, without great correction, a mellowneſs of pencil, and a beautiful mixture of colours.

Antonio Allegri, called *Corregio*, was the father and greateſt ornament of this ſchool. He began like the painters of his time to imitate nature alone; but, as he was chiefly delighted with the graceful, he was careful to purify his deſign from all ſhort turnings and unneceſſary angles. He perceived that largeneſs contributed to grace; and therefore he not only rejected all ſmall figures, but enlarged as much as poſſible the outlines, avoided acute angles and ſtraight lines, and by theſe means gave an eaſy grandeur to his deſign. He made his figures elegant and large; he varied the outlines by frequent undulations; but he was not always pure and correct.

Corregio painted in oil, a kind of painting ſuſceptible of the greateſt delicacy and ſweetneſs; and as his character led him to cultivate the agreeable, he gave a pleaſing captivating tone to all his pictures. He ſought tranſparent colours to repreſent ſhades conformable to nature, and adopted a manner of glazing which actually rendered his ſhadows more obſcure. Obſcurity in painting cannot be fully obtained without tranſparent colours; for theſe abſorb the rays of light, and of conſequence give leſs reflection. He laid his colours very thick on the brighteſt parts of his pictures, to make them capable of receiving, by a proper touch, the greateſt degree of light. He perceived, that the reflections of light correſpond with the colour of the body from which they are reflected; and on theſe principles he founded his theory of colours with reſpect to light and ſhade and reflection. But it is chiefly in the colour of his ſhades that he deſerves to be imitated; for his lights are too clear, and ſomewhat heavy; and his fleſhy parts are not ſufficiently tranſparent.

Harmony and grace are connected together; and on this account Corregio excelled alſo in harmony. As the delicacy of his taſte ſuffered him not to employ ſtrong oppoſitions, he naturally became a great maſter in this part, which chiefly conſiſts of eaſy gradations from one extreme to another. He was harmonious in his deſign, by making the lines which formed the angles of the contour arched and undulated. But in the lights and ſhades, he placed always between the two extremes a ſpace which ſerved to unite them, and to form a paſſage from the one to the other. The delicacy of his organs made him perceive, better than any other artiſt, what relief was neceſſary to the eye after a violent exertion; and he was therefore careful to follow a bold and prevailing colour with a demi-tint, and to conduct the eye of the ſpectator, by an inviſible gradation, to its ordinary ſtate of tenſion. In the ſame manner (ſays Mengs) does agreeable and melting muſic pull one ſo gently out of ſleep, that the awaking reſembles inchantment more than the diſturbing of repoſe. A delicate taſte in colours, a perfect knowledge of the claro obſcuro, the art of uniting light to light, and ſhade to ſhade, together with that of detaching the objects from the ground, inimitable, grave, and perfect harmony, were the qualities which diſtinguiſhed Corregio from all the painters, and placed him near the head of his profeſſion.

The Carracci, Lewis, Auguſtin, and Hannibal, formed what is called the *ſecond Lombard ſchool*, which is frequently diſtinguiſhed by the name of the *ſchool of Bologna*.

Lewis was the maſter of the other two; he had ſtudied the works of Titian and Paul Veroneſe at Venice, thoſe of André del Sarte at Florence, thoſe of Corregio at Parma, and thoſe of Jules Romaen at

Mantua,

Schools.

Mantua ; but he chiefly endeavoured to imitate the manner of Corregio. Hannibal fluctuated between Corregio and Titian. Auguſtin their rival in painting had his mind cultivated by learning, and devoted part of his time to poetry and muſic, to dancing and to other manly exerciſes. Theſe three painters often employed their talents on the ſame piece ; and it was admirable that their united labours ſeemed to be animated with the ſame ſpirit.

They eſtabliſhed an academy at Bologna, which their zeal for the advancement of their art made them call *l'Academia degli Deſideroſi* ; but it was afterward called the *Academy of the Caracci*, becauſe the reputation which theſe artiſts acquired, permitted not a more illuſtrious name to be given to an eſtabliſhment of which they were the founders. In this ſchool were taught the art of conſtructing models, perſpective, and anatomy ; leſſons were given on the beautiful proportions of nature, on the beſt manner of uſing colours, and on the principles of light and ſhade. They held frequent conferences, in which not only artiſts, but men of general knowledge, were permitted to elucidate points relative to the art of painting : but they were ſeparated upon Hannibal's going to Rome to adorn the gallery of the cardinal Farneſe.

The works of the Caracci are often, from the reſemblance of their manner, confounded together ; eſpecially thoſe which were finiſhed previous to the reſidence of Hannibal at Rome. Meanwhile each of them has a decided character diſtinct from the other two. Lewis had leſs fire, but more of gracefulneſs and grandeur ; Auguſtin had more ſpirit in his conception, and more pleaſantneſs in his execution : Hannibal is characterized by boldneſs, by a deſign more profound, by an expreſſion more lucky, and by an execution more ſolid.

Sir Joſhua Reynolds, who ſaw the works of Lewis at Bologna, holds him out in his diſcourſes as the beſt model for what is called *ſtyle* in painting ; which is the faculty of diſpoſing colours in ſuch a manner as to expreſs our ſentiments and ideas. "Lodovico Caracci," ſays he, "(I mean in his beſt works) appears to me to approach the neareſt to perfection. His unaffected breadth of light and ſhadow, the ſimplicity of colouring, which, holding its proper rank, does not draw aſide the leaſt part of the attention from the ſubject, and the ſolemn effect of that twilight which ſeems diffuſed over his pictures, appears to me to correſpond with grave and dignified ſubjects better than the more artificial brilliancy of ſunſhine which enlightens the pictures of Titian."

Hannibal is eſteemed by the beſt judges as a model for beauty and deſign. Thoſe who blame him for becoming leſs a colouriſt at Rome than he was at Bologna, ought to recollect that it is his performances at Rome which have chiefly ſecured his reputation. Severe critics have maintained that his deſign is too little varied in his figures ; that he excels only in male beauty ; that in imitating ancient ſtatues, he excites ſome reſemblance, but without arriving at the ſublimity of ideas and of ſtyle which characterize the ancients ; or, in other words, that he hath ſucceſsfully imitated the exterior of their manner, but that he was incapable of reaching the interior and profound reaſonings which determined thoſe admirable artiſts.

The ſucceſs of Hannibal, and the reputation which he acquired, have been pernicious to the art. His ſucceſſors, deluded by theſe conſiderations, have made him the object of their imitation, without aſcending to the ſources from which he derived his knowledge, and which he never could equal. The reſult has been, that, inſtead of becoming equal to Hannibal, they have often copied his imperfections.

17 The French Schools.

This ſchool has been ſo different under different maſters, that it is difficult to characterize it. Some of its artiſts have been formed on the Florentine and Lombard manner, others on the Roman, others on the Venetian, and a few of them have diſtinguiſhed themſelves by a manner which may be called their own. In ſpeaking in general terms of this ſchool, it appears to have no peculiar character ; and it can only be diſtinguiſhed by its aptitude to imitate eaſily any impreſſion ; and it may be added, ſpeaking ſtill in general terms, that it unites, in a moderate degree, the different parts of the art, without excelling in any one of them.

It is equally difficult to determine the progreſs of painting in France. Miniature painting, and painting on glaſs, were early cultivated in that country ; and in theſe two kinds, the Italians had often recourſe to the French artiſts. When Francis I. encouraged Roſſo a Florentine, and Primatice a Bologuian, the painters in France were not remarkable for any ſuperior talent ; but they were capable of working under theſe foreign artiſts.

Couſin, a painter on glaſs, and portrait-painter, was the firſt who eſtabliſhed any kind of reputation in France. He was correct, but poſſeſſed very little elegance of deſign.

Painting, for ſome time encouraged by Francis I. fell into a ſtate of languor, from which it was not recovered till the reign of Louis XIII. Jacques Blanchard, formed at the Venetian ſchool, and called *the French Titian*, flouriſhed about this period. But as he died young, and without educating any pupils to perpetuate his manner, he muſt be regarded as a ſingle good artiſt, and not as a founder of the French ſchool.

In the ſame manner Pouſſin, one of the greateſt French painters, and whom they call *the Raphael of France*, educated no pupils, nor formed any ſchool. His ſtyle and character of painting are deſcribed by Sir Joſhua Reynolds as ſimple, careful, pure, and correct. No works of any modern (adds the ſame author) have ſo much of the air of antique painting as thoſe of Pouſſin. His beſt performances have a remarkable dryneſs of manner, which, though by no means to be recommended for imitation, yet ſeems perfectly correſpondent to that ancient ſimplicity which diſtinguiſhes his ſtyle.

In the latter part of his life he changed from this manner to one much ſofter and richer ; where there is a greater union between the figures and the ground. His favourite ſubjects were ancient fables ; and no painter was ever better qualified to paint ſuch ſubjects, not only from his being eminently ſkilled in the knowledge of the ceremonies, cuſtoms, and habits of the ancients, but from his being ſo well acquainted with the different characters which thoſe who invented them gave their allegorical figures.

If Pouſſin, in the imitation of the ancients, repreſents Apollo driving his chariot out of the ſea by way of repreſenting the ſun riſing, if he perſonifies lakes and rivers, it is no way offenſive in him, but ſeems perfectly of a piece with the general air of the picture. On the contrary, if the figures which people his pictures had a modern air or countenance, if they appeared like our countrymen, if the draperies were like cloth or ſilk of our manufacture, if the landſcape had the appearance of a modern view, how ridiculous would Apollo appear? inſtead of the ſun, an old man; or a nymph with an urn, inſtead of a river or a lake.

Pouſſin, however, more admired than imitated, had no manner of influence in forming the French ſchool. Simon Vouet, his enemy and perſecutor, had this honour, becauſe his pupils, in the happy age of the arts in France, conferred on it the higheſt ſplendor. Vouet was a man of diſtinguiſhed abilities; but the ſchool which he erected would have had no continuance if his ſcholars had purſued his manner of painting. He had a kind of grandeur and facility; but his deſign was falſe with regard to colours, and without any idea of expreſſion. It was ſaid of him, that he only needed to take the pencil in his hand to finiſh with one ſtroke the ſubject which he had conceived; and on this account one is tempted to be pleaſed, becauſe he is aſtoniſhed. He had the merit of deſtroying the inſipid manner which reigned in France, and of pointing the way to a better taſte.

If Vouet laid the foundation of the French ſchool, Le Brun finiſhed the edifice. When Le Brun was placed under the tuition of Vouet, he aſtoniſhed his maſter and the reſt of his pupils with the rapidity of his progreſs. At the age of 26 he finiſhed his piece called the *horſes of Diomede*, which gained a place in the palace royal (A), beſide thoſe of the moſt eminent painters. He was afterwards recommended to Pouſſin; but the young artiſt was more diſpoſed by his natural inclinations to that modern part of the art which is called the *great machine*, than to the profound and ſtudied manner of the Greek artiſts. Pouſſin at the ſame time was of great ſervice to him, in recommending to his ſtudy the monuments, the cuſtoms, the dreſs of the ancients; their architecture, their rites, their ſpectacles, their exerciſes, their combats, and their triumphs.

Le Brun had a noble conception and a fruitful imagination. He was on no occaſion inferior to the vaſt compoſitions which he undertook, and he chiefly excelled in rigorous coſtume and exact likeneſſes.

Few painters have united ſo great a number of eſſential qualities and acceſſories of the art; and if he had ſuperiors, it conſiſted in this, that they poſſeſſed ſome particular quality in a more eminent degree.—He was a good drawer, but his deſign was far from being ſo elegant as that of Raphael, or ſo pure as that of Domenique, and it was leſs lively than that of Hannibal Carracci, whom he had taken for a model. In drapery he followed the Roman ſchool: the clothes which he gave to his figures were not like thoſe of the Venetian ſchool, of ſuch and ſuch a ſtuff; they were draperies and nothing more, and this manner agreed with the heroic ſtyle of his works; but in this part he was not equal to the painter of Urbino.—He had ſtudied the expreſſion of the affections of the ſoul, as is evident from his treatiſe on the character of the paſſions: but after obſerving the general characters, and eſtabliſhing the principal ſtrokes of expreſſion, he thought he reached the whole extent of this ſubject, which is ſo infinitely extended. He always employed the few characters which he had once found out, and neglected to ſtudy the prodigious variety of gradations by which the interior affections are manifeſted in the exterior appearance. He fell then into the manner of repeating always; and poſſeſſed neither the delicacy, nor the depth, nor the extreme juſtneſs, of Raphael's expreſſion. He loved and poſſeſſed in a high degree the grand machine of the art; he was delighted with great compoſitions; and he gave them life, and animation, and variety; but he wanted the vigour and inſpiration of Raphael. His compoſitions are formed on philoſophical principles, but thoſe of Raphael are created. Le Brun thought well; Raphael, Pouſſin, le Sueur, thought moſt profoundly.—Le Brun had elevation, but he was not elevated like Raphael, to the ſublime.

In colouring, Le Brun did not imitate the painters of the Venetian ſchool. The ſweet attractions and ſtrong and ſolid colours of the ſchools of Rome and Lombardy ſeem rather to have been the object of his imitation; and from them alſo he learned an eaſy, agreeable, and bold management of the pencil.

As Le Brun poſſeſſed a great ſhare of lively imagination, he delighted in allegory, which gives the greateſt ſcope for ingenious invention. The fecundity and reſources of his imagination appeared ſtill farther, in his inventing ſymbols for his allegorical figures, without reſting contented with thoſe employed by the ancients. But fanciful repreſentations of this kind are diſtant from the operations of true genius. Spirit and thought in the arts are very different from ſpirit and thought in literary productions. A painter of moderate abilities may introduce into his works a great deal of the invention which belongs to poetry without enriching his peculiar art. The true ſpirit of painting conſiſts in making the figures appear in the very circumſtances and attitudes in which they are ſuppoſed to act, and penetrated with the ſentiments with which they ought to be affected. By theſe means the ſpectator is more certainly intereſted than if the actions and thoughts were repreſented by allegorical ſymbols. Pouſſin appears to have leſs waſte of ſpirit and imagination than Le Brun, while at the ſame time he gives more delight to people of ſpirit and imagination.

Euſtach le Sueur was the contemporary and rival of Le Brun; and no painter approached nearer to Raphael in the art of drapery, and in diſpoſing the folds in the moſt artful and the nobleſt manner. His deſign was in general more ſlender than that of Raphael, but, like his, it was formed on the model of the ancients. Like Raphael he repreſented with art and preciſion the affections of the ſoul; like him, he varied the air of the head, according to the condition, the age, and the character of his perſonages; and, like him, he made the different parts of every figure contribute to the general effect. His intention in compoſing was to expreſs his ſubject, not to make ſhining contraſts

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(A) Where it may now be is uncertain. Perhaps it has periſhed in the wreck of taſte, art, ſcience, and elegance, againſt which French democracy has waged a ruinous war.

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contraſts or beautiful groups of figures, not to aſtoniſh and bewitch the ſpectator by the deceitful pomp of a theatrical ſcene, or the ſplendor of the great machine. His tones are delicate, his tints harmonious, and his colours, though not ſo attractive as thoſe of the ſchools of Venice and Flanders, are yet engaging. They ſteal peaceably on the ſoul, and fix it without diſtraction on the parts of the art, ſuperior to that of colouring.

His preaching of St Paul, and the picture which he painted at St Gervais, which the critics compare with the beſt productions of the Roman School, and the 22 pictures which he painted for the Carthuſian monaſtery at Paris, and which were lately in poſſeſſion of the king, are eſteemed his beſt pieces. His contemporaries affirm, that he conſidered as ſketches merely thoſe excellent performances which are the glory of the French ſchool.

If Le Sueur had lived longer, or if, like Le Brun, he had been employed under a court, fond of the arts, and of learning, to execute the great works of the age, the French ſchool would have adopted a different and a better manner. The noble beauty of his heads, the ſimple majeſty of his draperies, the lightneſs of his deſign, the propriety of his expreſſion and attitudes, and the ſimplicity of his general diſpoſition, would have formed the character of this ſchool. The deceitful pomp of theatrical decoration would have been more lately introduced, or perhaps would never have appeared, and Paris might have been the counterpart to Rome. But as Le Brun, by an accidental concurrence of favourable circumſtances, was the faſhionable painter, to be employed or rewarded it was neceſſary to imitate his manner; and as his imitators poſſeſſed not his genius, his faults became not only current but more deformed.

The French School not long ago changed its principles; and if, when peace ſhall be reſtored to this unhappy nation, they continue to follow the road which, while the arts flouriſhed among them, they marked out for themſelves, they have the chance of becoming the moſt rigid obſervers of the laws impoſed on the Greek artiſts. The Count de Ceyles, pupil of Bouchardion, who by his rank and fortune had the means of encouraging the imitators of the ancients, and of the maſters of the 15th century, firſt formed the deſign of reſtoring a pure taſte to the art of painting. He was ſeconded by the talents of M. Vien, an artiſt who had only occaſion to have his leſſons and his example laid before him.—In this manner commenced a revolution, ſo much the more wonderful, as it was ſcarcely ever known that any nation ſubſtituted a ſyſtem of ſimple and rigid excellence in place of a falſe and glittering taſte. The hiſtory of all nations, on the contrary, diſcovers a gradual progreſs from a rude beginning to perfection, and afterwards to irremediable decay. The French had the proſpect of ſtopping ſhort in this ordinary courſe. They began in a manner which promiſed ſucceſs; and the beſt conſequences may be expected, if the internal commotions of France do not deſtroy the taſte for the arts, the exerciſe of which they have ſuſpended.

18 The German ſchool.

In Germany there can hardly be ſaid to be a ſchool, as it is a continuation of ſingle artiſts, who derived their manner from different ſources of originality and imitation. There were ſome German painters of eminence, when the art, emerging from its barbarous ſtate, firſt began to be cultivated with ſucceſs in Europe. As they were totally unacquainted with the ancients, and had ſcarcely acceſs to the works of their contemporaries in Italy, they copied nature alone, with the exception of ſomewhat of that ſtiffneſs which forms the Gothic manner. It is this manner, if we ſpeak of the early German painters, which characterizes their ſchool. But this is by no means the caſe with their ſucceſſors, part of whom were educated in Flanders and part in Italy: For if Mengs or Dietrich were comprehended in this School, there would be nothing peculiar to its manner diſcovered in their works. And it is therefore neceſſary to confine our obſervations to the more ancient German painters, in whom the Gothic ſtyle is conſpicuous.

Albert Durer was the firſt German who corrected the bad taſte of his countrymen. He excelled in engraving as well as painting. His genius was fertile, his compoſitions varied, his thoughts ingenious, and his colours brilliant. His works, though numerous, were finiſhed with great exactneſs; but as he owed every thing to his genius, and as works of inferior merit were by the falſe taſte of the times preferred to his, it was impoſſible for him altogether to avoid the faults of his predeceſſors. He is blamed for ſtiffneſs and aridity in his outlines, for little taſte or grandeur in his expreſſion, for ignorance of the coſtume of aerial perſpective and of gradation of colours; but he had carefully ſtudied lineal perſpective, architecture, and fortification.

John Holbeen or Holbein, nearly contemporary with Albert Durer, painted in oil and water colours. He excelled chiefly in hiſtory and in portrait painting. His colours are freſh and brilliant, and his works are highly finiſhed; but in his hiſtorical ſubjects, his draperies are not in ſo good a taſte as thoſe of Albert Durer.

19 The Flemiſh ſchool.

The Flemiſh ſchool is recommended to the lovers of the art by the diſcovery, or at leaſt the firſt practice, of oil painting. Van Mander gives us the account of this wonderful diſcovery in the following words: "John Van Eyck was ſo excellent a chemiſt, that he diſcovered a method of varniſhing his diſtemper colours with a varniſh, which was made of ſome oils, and was very pleaſing on account of the gloſs and luſtre it gave them. Many artiſts in Italy had vainly attempted to find out that ſecret; they never hit on the true method. It happened once that John, in his uſual manner, having highly finiſhed one of his pictures on boards, and having varniſhed it with his new invented varniſh, expoſed it to dry in the ſun; but whether the boards were not well joined, or whether the heat of the ſun was too violent, the boards ſplit aſunder and opened in the junctures. John ſaw with concern that his work was ſpoiled, and reſolved to contrive ſomothing againſt future accidents of the ſame kind. Being diſguſted at diſtemper painting and varniſhing, he thought of a varniſh that might dry without ſunſhine; and having tried many oils and ſubſtances, he found that linſeed and nut oil dried better than any other. He boiled them with ſome other drugs, and produced the beſt varniſh in the world. Ever bent on improvements, he found, after much inquiry, that colours mixed with theſe oils worked and dried extremely well, and when dried would be

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be water-proof. He obſerved likewiſe, that theſe oils would animate and give them a gloſs and luſtre without any farther varniſhing." The truth, however, of this account is now very much queſtioned; and it is even proved by the manuſcripts of Theophilus Preſbyter, and alſo by ſome old oil paintings in England, that this method of painting was diſcovered long before the time of John Van Eyck. At the ſame time we admit, that John and his brother Hubert may have been the firſt who brought oil painting into general practice, not only by ſhowing the excellence of which it was ſuſceptible, but alſo by making ſeveral improvements on the art. And this is the more probable, from the great reputation which their pictures acquired over all Europe, by the ſoftneſs and delicacy of their colours. The attention of the Italian painters was chiefly excited, inſomuch that Antoine de Meſſina performed a journey into Flanders for the expreſs purpoſe of acquiring the confidence of John Van Eyck, and of diſcovering the ſecret.

John de Bruges was the founder of painting as a profeſſion in Flanders; Peter Paul Rubens was the founder of the art. This extraordinary perſon produced an immenſe number of works. He excelled equally in hiſtorical, portrait, and landſcape painting; in fruits, flowers, and in animals. He both invented and executed with the greateſt facility; and to ſhow the extent of his powers, he frequently made a great number of ſketches on the ſame ſubject altogether different, without allowing any time to elapſe between them. The works of Rubens were deſtitute of that ſoft inſpiration, productive of ſweet and pleaſant effects, ſo conſpicuous in the works of Raphael; but he poſſeſſed that ſprightlineſs of genius and ſtrength of mind which is ever ready to burſt forth in wonderful and aſtoniſhing effects. His figures appear to be the exact counter-part of his conceptions, and their creation nothing more than a ſimple act of the will.

His talent for deſign is unjuſtly cenſured, for on every occaſion his deſign is noble and eaſy. He had great knowledge of anatomy, but he was hurried away by the impetuoſity of his imagination and the ardour for execution; he preferred ſplendor to the beauty of forms, and ſacrificed correctneſs of deſign too often to the magic of colours. In ſhort, his qualities ſuppoſe a mind full of fire and vigour, rather than accuracy or profound thought. His drapery may be conſidered rather as fine than properly adapted to his figures; for, in the language of the art, to *clothe* and to *give drapery* are not ſynonymous terms. A portrait painter may excel in clothing his perſonages, while he is totally incapable of giving good drapery to an hiſtorical painting. His chief merit conſiſts in colouring; though in this branch of the art he has not equalled Titian. He is the firſt among painters eminent for pomp and majeſty; the firſt among thoſe who ſpeak to the eye, and the power of the art is often carried by him almoſt to enchantment.

It is evident from the works of Rubens, that his method of painting was to lay the colours in their place, one at the ſide of another, and mix them afterwards by a ſlight touch of the pencil. Titian mingled his tints as they are in nature, in ſuch a manner as to make it impoſſible to diſcover where they began or terminated; the effect is evident, the labour is concealed. Thus Rubens is more dazzling, and Titian more harmonious. In this part, the firſt excites the attention, the ſecond fixes it. The carnations of Titian reſemble the bluſh of nature; thoſe of Rubens are brilliant and poliſhed like ſatin, and ſometimes his tints are ſo ſtrong and ſeparated as to appear like ſpots.

"Rubens (ſays Sir Joſhua Reynolds) is a remarkable inſtance of the ſame mind being ſeen in all the various parts of the art. The whole is ſo much of a piece, that one can ſcarce be brought to believe but that if any one of them had been more correct and perfect, his works would not be ſo complete as they appear. If we ſhould allow a greater purity and correctneſs of drawing, his want of ſimplicity in compoſition, colouring, and drapery, would appear more groſs."

In his compoſition his art is too apparent. His figures have expreſſion, and act with energy, but without ſimplicity or dignity. His colouring, in which he is eminently ſkilled, is notwithſtanding too much of what we call *tinted*. Throughout the whole of his works there is a proportionable want of that nicety of diſtinction and elegance of mind, which is required in the higher walks of painting; and to this want it may be in ſome degree aſcribed, that thoſe qualities which make the excellency of this ſubordinate ſtyle appear in him with their greateſt luſtre.—Indeed the facility with which he invented, the richneſs of his compoſition, the luxuriant harmony and brilliancy of his colouring, ſo dazzle the eye, that, whilſt his works continue before us, we cannot help thinking that all his deficiencies are fully ſupplied.

The Flemiſh ſchool, of which Rubens is the greateſt maſter, is remarkable for great brilliancy of colours and the magic of the *claro-obſcuro*. To theſe may be joined a profound deſign, which is yet not founded on the moſt beautiful forms; a compoſition poſſeſſed of grandeur, a certain air of nobleneſs in the figures, ſtrong and natural expreſſions; in ſhort, a kind of national beauty, which is neither copied from the ancients nor from the Roman nor Lombard ſchools, but which deſerves to pleaſe, and is capable of pleaſing.

20
The Dutch ſchool.

To ſpeak in general terms, and without regarding a great number of exceptions, the Dutch ſchool carries none of the above qualities to great perfection, except that of colouring. Far from excelling in the beauty of heads and forms, they ſeem chiefly to delight in the exact imitation of the loweſt and moſt ignoble. Their ſubjects are derived from the tavern, the ſmith's ſhop, and from the vulgar amuſements of the rudeſt peaſants. The expreſſions are ſufficiently marked; but it is the expreſſion of paſſions which debaſe inſtead of ennobling human nature. One would think that they practiſed the art of degrading the bodies and ſouls of men.

It muſt be acknowledged, at the ſame time, that the Dutch painters have ſucceeded in ſeveral branches of the art. If they have choſen low objects of imitation, they have repreſented them with great exactneſs; and truth muſt always pleaſe. If they have not ſucceeded in the moſt difficult parts of the claro-obſcuro, they at leaſt excel in the moſt ſtriking, ſuch as in light confined in a narrow ſpace, night illuminated by the moon or by torches, and the light of a ſmith's forge. The Dutch underſtand the gradations of colours; and by their knowledge of contraſt they have arrived at the art of painting light itſelf. They have no rivals in landſcape painting, conſidered as the faithful repreſentation or picture of a particular ſcene; but they are far from equalling Titian, Pouſſin, Claude Lorrain, &c. who have carried to the greateſt perfection the ideal landſcape, and whoſe pictures, inſtead of being the topographical repreſentation of certain places, are the combined reſult of every thing beautiful in their imagination or in nature. The Dutch, however, diſtinguiſh themſelves by their perſpective, by their clouds, ſea-ſcenes, animals, fruits, flowers, and inſects; and they excel in minature painting. In ſhort, every thing which requires a faithful imitation, colour, and a nice pencil, is well executed by the Dutch painters.

Holland has alſo produced hiſtory painters, as Octavius Van Been, and Vander Hilſt the rival of Vandyke, and perhaps his ſuperior: but it is not in the works of thoſe artiſts that we find the character of the Dutch ſchool.

Neither is the origin of their ſtyle to be derived from the works of Lucas of Leyden, though, from the time he flouriſhed, viz. about the end of the 15th century, he may be conſidered as the patriarch of the Dutch ſchool. Lucas painted in oil, in water colours, and on glaſs; and the kinds of his painting were hiſtory, landſcape, and portrait. His picture of the Laſt Judgment is preſerved in the Hotel-de-Ville of Leyden; it poſſeſſes vaſt merit in point of compoſition, and a great variety of figures.

If miniature painting be conſidered as a characteriſtic of the Dutch ſchool, Cornelius Polembourg may be regarded as the father of it. He poſſeſſed the colour, delicacy of touch, and diſpoſition of the claro-obſcuro, which chiefly diſtinguiſh this ſchool; and if any thing is to be added, it is want of correctneſs in his deſign.

But if the choice of low figures is its chief characteriſtic, this is to be found in the greateſt perfection in the works of the celebated Rembrandt Vanryn; and it is the more offenſive in this artiſt, as his compoſitions frequently required an oppoſite choice of figures. As his father was a miller near Leyden, his education muſt altogether have depended on the exertion of great talents and the ſtudy of nature. He ſtudied the groteſque figure of a Dutch peaſant or the ſervant of an inn with as much application as the greateſt maſters of Italy would have ſtudied the Apollo of Belvidere or the Venus de Medicis. This was not the manner of elevating himſelf to the noble conceptions of Raphael; but it was acquiring the imitation of truth in vulgar painting.

"Rembrandt (ſays M. Deſcamps) may be compared to the great artiſts for colour and delicacy of touch and claro-obſcuro. It appears that he would have diſcovered the art, though he had been the firſt perſon that ever attempted it. He formed to himſelf rules and a method of colouring, together with the mixture of colours and the effect of the different tones. He delighted in the great oppoſitions of light and ſhade; and he ſeems to have been chiefly attentive to this branch of the art. His workſhop was occaſionally made dark, and he received the light by a hole, which fell as he choſe to direct it on the place which he deſired to be enlightened. On particular occaſions he paſſed behind his model a piece of cloth of the ſome colour with the ground he wanted; and this piece of cloth receiving the ſame ray which enlightened the head, marked the difference in a ſenſible manner, and allowed the painter the power of augmenting it according to his principles.

"Rembrandt's manner of painting is a kind of magic. No artiſt knew better the effects of different colours mingled together, nor could better diſtinguiſh thoſe which did not agree from thoſe which did. He placed every tone in its place with ſo much exactneſs and harmony, that he needed not to mix them, and ſo deſtroy what may be called the flower and freſhneſs of the colours. He made the firſt draught of his pictures with great preciſion, and with a ture of colours altogether particular: he proceeded on his firſt ſketch with a vigorous application, and ſometimes loaded his lights with ſo great a quantity of colour, that he ſeemed to model rather than to paint. One of his heads is ſaid to have a noſe nearly as much projected as the natural noſe which he copied."

Such is the power of genius, that Rembrandt, with all his faults, and they are enormous, is placed among the greateſt artiſts by M. Deſcamps, who ſaw his works, and was himſelf an artiſt. It is neceſſary to obſerve, that if Rembrandt was ignorant of the eſſential parts of his art, or neglected them, he was yet acquainted with expreſſion, which alone was capable of giving animation to his works. His expreſſions are not noble, but they are juſt, lively, and executed with great judgment.

[illegible] de Laer, a miniature painter, and who made [illegible]ice of his ſubjects from common life, deſerves a diſtinguiſhed place in the Dutch ſchool. He painted hunting ſcenes, the attacks of robbers, public feſtivals, landſcapes, and ſea-views; and he ornamented his pictures with old ruins, and enriched them with figures of men and animals. He had a correct deſign, and employed vigorous and lively colouring.

Van Oſtade, although born at Lubeck, Gerard Dow, Metzu, Miris, Wouwermans, Berghem, and the celebrated painter of flowers Van-Huyſum, belong to the Dutch ſchool.

The greater part of the ſchools of which we have treated have no longer any exiſtence. Italy alone had four ſchools, and there only remain at preſent a very few Italian artiſts known to foreigners. The ſchool of Rubens is in vain ſought for in Flanders. If the Dutch ſchool ſtill exiſts, it is not known beyond the precincts of Holland. Mengs a German artiſt has made himſelf famous in our days; but it was in Italy that he chiefly improved his talents and exerciſed his art. M. Dietrich another German, has made himſelf known to ſtrangers: but two ſolitary artiſts do not form a ſchool.

21 The Engliſh ſchool.

A new ſchool is formed in our times and in our own country, called the *Engliſh ſchool*. It is connected with the academy in London, inſtituted in 1766 by letters patent from the king, and founded only in 1769. Sir Joſhua Reynolds is the undoubted founder of it. His works give him a diſtinguiſhed rank among the artiſts of the preſent age, and exhibit a genius in their author which has ſeldom been ſurpaſſed: but the effects which he has contrived to give to them by the formation of a new ſchool, and by the good principles which his diſcourſes to academicians, and his example as a painter, have diſſeminated, will ſecure his reputation as long as England ſhall eſteem the advantages and the worth of great abilities. The Engliſh taſte appears to be formed on the great maſters of the Italian and the Flemiſh ſchools. Sir Joſhua was a great admirer of Michael Angelo, and particularly recommends him to the attention of the academicians. “I feel (ſays Sir Joſhua), a ſelf-congratulation in knowing myſelf capable of ſuch ſenſations as he intended to excite. I reflect, not without vanity, that theſe diſcourſes bear teſtimony of my admiration of that truly divine man; and I ſhould deſire that the laſt words which I ſhould pronounce in this academy, and from this place, might be the name of—*Michael Angelo.*” But though he thus enthuſiaſtically admired this very great man, yet he allows, what cannot indeed be denied, that he was capricious in his inventions: “and this (ſays he) may make ſome circumſpection neceſſary in ſtudying his works; for though they appear to become him, an imitation of them is always dangerous and will prove ſometimes ridiculous. ‘In that dread circle none durſt tread but he.’ To me, I confeſs, his caprice does not lower the eſtimation of his genius, even though it is ſometimes, I acknowledge, carried to the extreme: and however thoſe eccentric excurſions are conſidered, we muſt at the ſame time recollect, that thoſe faults, if they are faults, are ſuch as never could occur to a mean and vulgar mind; that they flowed from the ſame ſource which produced his greateſt beauties; and were therefore ſuch as none but himſelf was capable of committing; they were the powerful impulſes of a mind unuſed to ſubjection of any kind, and too high to be controuled by cold criticiſm.

The effect of Sir Joſhua's diſcourſes is viſible in the pictures of this ſchool. The Death of General Wolf, the Departure of Regulus for Carthage, the Arrival of Agrippina, and ſome other ſubjects, are decided proofs that the Engliſh ſchool is acquainted with greatneſs of ſtyle, boldneſs of expreſſion, and the art of managing a great number of figures. It will be fortunate for the painters of this ſchool, if, more rigid with regard to their forms than ambitious of poignant and aſtoniſhing effects, they ſupport the character which they have already acquired. But although England had not enjoyed this brilliant ſucceſs in painting, ſhe would have immortalized herſelf by the excellency of her engravings.

It is eaſy to perceive in all thoſe ſchools the cauſe of the character which diſtinguiſhes them. In the Roman ſchool, it is the excellent education of its firſt maſters, together with the precious remains of antiquity found in the ruins of ancient Rome. In the Venetian ſchool, the magnificence derived from the commerce of the eaſt, the frequency of feaſts and maſquerades, and the neceſſity of painting to the rich and luxurious, who were accuſtomed to behold theſe magnificent objects, were the cauſes of its gaudy taſte. In the Dutch ſchool, the peculiarity of its grovelling manner may be accounted for from the habits of the artiſts. Accuſtomed to viſit taverns and workſhops, and having moſt commonly expoſed to their view low and groteſque figures, they repreſent in their pictures the objects which were moſt familiar to them in life.

“Beauty (ſays a French writer *) ought to be the characteriſtic of the Engliſh ſchool, becauſe the artiſts have it often expoſed to their view. If this beauty is not preciſely ſimilar to that among the ancients, it is not inferior to it. The Engliſh ſchool ſhould alſo diſtinguiſh itſelf for truth of expreſſion; becauſe the liberty enjoyed in that country gives to every paſſion its natural and unbiaſſed operation. It will probably long preſerve its ſimplicity unpolluted by the pomp of theatrical taſte and the conceit of falſe graces, becauſe the Engliſh manners will long preſerve their ſimplicity.

“Examine the picture of a Frenchwoman (continues he) painted by an artiſt of that nation, and you will generally find, in place of expreſſion, a forced grin, in which the eyes and the forehead does not partake, and which indicates no affection of the ſoul. Examine the picture of an Engliſhwoman done by one of their painters, and you obſerve an elegant and ſimple expreſſion, which makes you at once acquainted with the character of the perſon repreſented.”

pari- tween the Ancient and Modern

SECT. III. *Compariſon between the Ancient and Modern Painting.*

No perſon of judgment or taſte heſitates to give the ſuperiority to the ancient ſculpture; but the moderns comfort themſelves with refuſing the ſame ſuperiority to the Greek artiſts in the art of painting. The ſmall number of their productions which remain, and the probable conjectures which may be formed concerning thoſe which have periſhed, go the length to prove that the Greek painters conducted themſelves on other principles than thoſe which have received the ſanction of cuſtom and the force of laws in our ſchools. But this cenſure might be applied with equal juſtice to Homer as an epic poet, and to Sophocles and Euripides as writers of tragedy.

The principal difference between the ancient and modern manner of painting conſiſts in the complication of figures, and the pompous decoration of ſcenery which prevails in the modern, when compared with the unity and ſimplicity of the ancient painters. This ſimplicity, however, does not ſeem to ariſe from the want of capacity, but from a choice, as Polygnotus, one of their moſt ancient painters, repreſents in one of his pieces the ſiege of Troy, and in another the deſcent of Ulyſſes into hell; but they ſoon decided in favour of ſimplicity, and their pieces generally contain one or two figures, and very rarely more than three or four.

Poetry in this particular is conducted on very different principles. A poet may with great propriety multiply his characters, and enter into details of a variety of actions, becauſe the whole of his characters and actions do not occupy the mind of his reader at the ſame time. The whole of his art conſiſts in making one naturally ſucceed another; but every part of the poem which contains a ſeparate tranſaction would make a picture capable of fixing the attention. In painting, the eye takes in the whole; and it is by no means ſatisfied if 20 or 30 figures are preſented to it, which it cannot poſſibly comprehend. It is in vain to group the figures, or to call the attention to the principal object by a greater degree of light; the ſpectator is anxious to examine every object which is preſented to him; and if they are not to be examined, for what reaſon are they painted? An excellent piece, at the ſame time, conſiſting of a great number of figures, will give pleaſure; but it is accompanied with that fatigue which one experiences when he runs over a gallery furniſhed with a great variety of excellent pictures.

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* Encyclop. Beaux Arts, tom. 1.

Compariſon between the Ancient and Modern.

Thoſe obſervations on the attention of the ſpectator led the Greeks to make ſimilar ones on the attention of the artiſt. They perhaps thought that the painter who had to execute a great variety of figures in the ſame work, could not ſtudy each of them with equal accuracy and care; and of conſequence that he might produce ſomething aſtoniſhing in the extent, and yet diſguſting in the detail.

This difference, however, between ancient and modern painting, cannot give any decided principle to determine on their comparative merit. We are accuſtomed to behold aſſemblages in nature; and it is a fact, that even in affecting ſcenes a great number of figures may not only be brought together, but that they may heighten the diſtreſs. It is ſuppoſing a picture to have little effect, to imagine that we can coolly, and with the ſame kind of attention, examine the principal and the acceſſory figures. If it is highly finiſhed, our whole ſoul muſt be abſorbed in that object which the artiſt intended to be moſt conſpicuous; and if we give any attention to the ſurrounding figures, we ſhall conſider them as ſpectators of the ſame ſcene, and derive from them an addition of ſympathy and of feeling. The whole queſtion in this particular point of view amounts to this, that the moderns have choſen a more difficult part; and if they have executed it with ſucceſs, their merit is greater. And this obſervation will hold good, unleſs it can be proved that it is utterly impoſſible to make an aſſemblage of figures lead to one general and common effect.

The proper manner of deciding the comparative merit of the ancients and moderns, is to conſider, as far as we have ſufficient data to go upon, to what degree the ancients excelled in the particular departments of this art. There are two ſources from which we can derive information; namely, from the morſels of antiquity which yet remain, and from what the ancient writers have ſaid on the ſubject of painting, both of which are extremely defective. It is allowed, however, by every ſkilful perſon who has viewed the remains of ancient paintings, that none of them appear to be the performances of ſuperior artiſts, notwithſtanding much merit in the deſign and accuracy in the drawing, which indeed ſeems to have been habitual to almoſt every ancient artiſt. The beſt among theſe paintings (according to Sir Joſhua Reynolds), "the ſuppoſed marriage in the Aldrobandine palace," is evidently far ſhort of that degree of excellence undoubtedly implied in the deſcriptions of ancient authors, and which from them we are fairly led to expect.

Still more defective, if poſſible, is this laſt ſpecies of evidence: for we have no direct treatiſe remaining on the ſubject by any of the ancients, although many were compoſed by their artiſts. The paſſages from which we are to decide are, either the curſory remarks of writers not expreſsly treating on the ſubject of painting, or the deſcriptions of thoſe who at beſt can rank but as *amateurs* of a faſhionable art. From theſe indeed we may pretty ſafely aſſert the degree of excellence which the paſſages imply; but we ſhould reaſon very inconcluſively, were we to deny them any higher or any other merit than appears to be ſtrictly contained in theſe ſcattered obſervations. Let any one for a moment place the modern painters in his mind in the ſame ſituation as the ancients, and he will quickly decide on the truth of theſe remarks.

Compariſon between the Ancient and Modern.

Nevertheleſs, it is neceſſary on this ſubject to derive ſome concluſions from the information which is occaſionally given in ancient authors. That the ancients paid a particular attention to deſign, would be evident from the manner in which they ſpeak of this department of the graphic art, even though the moderns were not in poſſeſſion of ſuch remaining proofs of their excellence herein (though by artiſts of an inferior claſs), as to place this point beyond the reach of doubt.

Indeed, when it is conſidered that, with reſpect to freedom and correctneſs of outline, painting and ſculpture are very nearly connected; that Phidias and Apelles were nearly contemporaries; that many of the ancient painters, ſuch as Zeuxis, Protogenes, Apelles, &c. were accuſtomed to modelling for the purpoſe of ſculpture or of caſting; that the extreme elegance of deſign in the ancient ſtatues is ſo notorious as to be the acknowledged model even for modern artiſts; and that theſe ornaments of ſculpture were well known and univerſally admired among the ancients—we ſhall have little heſitation in admitting their equality with the moderns ſo far as deſign is concerned. But ſhould any doubt remain on this point, the drawings from the antiquities of Herculaneum will be ſtriking proofs that truth, elegance, and ſpirit, in a degree rarely to be met with among the moderns, were habitual even to the common run of artiſts in the declining age of ancient painting.

The ancients excelled moreover not merely in the common and obvious parts of deſign; but they appear to have had no inconſiderable degree of ſkill in the art of *foreſhortening*. The performance of Pauſias is a proof of this: *Fecit autem grandes tabulas ſicut ſpectatam in Pompeii porticibus boum immolationem. Eam enim picturum primus invenit, quam poſtea imitati ſunt multi, equavit nemo. Ante omnia, cum longitudinem bovis oſtendere vellet, adverſum eum pinxit, non tranſverſum, et abunde intelligitur amplitudo. Dein cum omnes qui volunt eminentia videri, candicantia faciant, coloremque condant, hic totum bovem atri coloris fecit; umbræque corpus ex ipſo dedit; magna prorſus arte in æquo extantia oſtendens et in confracto ſolida omnia.*

Nor will it be difficult to ſhow, that the ancient painters were not inferior to the moderns in *expreſſion*. The ſtate of ſculpture alone among the ancients would almoſt furniſh a deciſive proof that the ſiſter art of painting could not be deficient. Among the ancient ſtatues which yet remain, expreſſion is carried to a wonderful height; not merely the features of the face, but almoſt every muſcle of the body, combining to enforce the idea intended to be conveyed.

Mr Webb * very properly obſerves, that "the ancients thought characters and manners ſo eſſential to painting, that they expreſsly term *picture* an art deſcriptive of manners. Ariſtotle in his *Poetics* ſays of Polygnotus, that he was a painter of the manners; and objects to Zeuxis, his weakneſs in this part." We have in Philoſtratus the following deſcription of a picture: "We may inſtantly (ſays he) diſtinguiſh Ulyſſes by his ſeverity and vigilance; Menelaus by his mildneſs; and Agamemnon by a kind of divine majeſty. In the ſon of Tydeus is expreſſed an air of freedom; Ajax is known by his ſullen fierceneſs; and Antilochus by his alertneſs. To give to theſe ſuch ſentiments and actions as are conſequential from their peculiar characters, is the ethic of painting."

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* *On Painting and Poetry*, p. 149.

Compariſon between the Ancient and Modern.

Another inſtance of excellence in expreſſion among the ancient paintings was the Medea of Timomachus. She was painted about to kill her infants. Auſonius ſpeaks with admiration of the mingled expreſſion of anger and maternal fondneſs in her face and manner.

> *Immanem exhauſit rerum in diverſa laborem*
> *Fingeret affectum matris ut ambiguum,*
> *Ira ſub eſt lachrymis, miſeratio non caret ira,*
> *Altere utrum videas ut ſit in altere utro.*

It may not be amiſs, however at this period of our inquiry, to make ſome obſervations on the teſtimonies of ancient authors reſpecting this ſubject.

It is certainly true, that when the works of an ancient artiſt are praiſed for any real or ſuppoſed merit, the commendations will be relative to the degree of perfection to which the art had ariſen at the time, and to the opportunities of information, the taſte, and judgement of the perſon who beſtows them. Excellence will always be aſcribed to him who leaves his cotemporaries far behind; and thoſe performances will often be conſidered as ſupremely beautiful which exceed in beauty all that have gone before.

In like manner, a perſon of natural ſenſibility, but who has been accuſtomed all his life to performances of an inferior ſtamp, will be in raptures at any which much exceed the beſt he has heretofore been taught to [illegible], and whatever opportunities of information he may have, his evidence will not be of much weight, if he do not poſſeſs a ſufficient degree of taſte and judgement to uſe them properly

In aſcertaining therefore the degree of credit due to the praiſes beſtowed on any performance in a branch of the fine arts, we muſt take into conſideration the general ſtate of the art at the time, and the competence of the perſon who beſtows the praiſe.

No ſlight degree of probability, however, may be attained on both theſe points, by attending to a circumſtance not generally noticed, viz. that in an advanced ſtate of the art, and when the obſerver is acquainted with his ſubject, the praiſe will ſeldom be given in looſe, general, and comprehenſive expreſſions; but the terms in which it is conveyed will be characteriſtic and determinate, and often technical; they will frequently ſhow the ſtate of the art, by marking the ſubdiviſions and the ſkill of the obſerver by judicious diſcrimination. When, added to theſe, the latter can reſort for compariſon to any exiſtent ſtandard of perfection, his praiſe may fairly be adopted in its full extent, and regarded as evidence upon the point in queſtion.

To apply theſe obſervations to painting, it is clear, with reſpect to the moſt difficult, the moſt fundamental, and the higheſt in rank among the departments of the art, viz. deſign and expreſſion, that the ancients were fully equal to the moderns; and their expreſſions of praiſe muſt be allowed to imply an equal degree of abſolute ſkill, with ſimilar expreſſions, if applied to the great maſters of modern art. It is alſo clear that painting was extremely cultivated among the ancients, and that their good painters were more eſteemed than artiſts of equal merit in modern times; that what we ſhould term gentlemen artiſts were frequent with them (*apud Romanos quoque honos mature huic arti contigit*); and that the expreſſion of the ancient connoiſſeurs evince much theoretical and technical knowledge of the art, and diſplay a diſtribution of its parts almoſt as minute, complete, and ſcientific, as the preſent ſtate of it can boaſt.

Compariſon between the Ancient and Modern.

With regard to colouring, the praiſes of the ancient authors chiefly relate to the ſtyle of it as exerted upon ſingle figures or particular tints. It may therefore be doubted whether the ancients were poſſeſſed of the art of diſtributing their colours through the whole of a picture, ſo as to produce an harmony and general tone of colouring ſimilar to that which we admire in the Lombard and Flemiſh ſchools. The preſent remains of ancient paintings do not appear to warrant any ſuch concluſions; but being undoubtedly the works of inferior hands, their authority is very ſmall when alleged againſt the general or particular merit of the ancient artiſts. The following extracts will be ſufficient to evince, that the ancients did attend to this technical branch of colouring.

Indeed the modern technical expreſſions appear borrowed from the following paſſage of Pliny, which may be regarded as deciſive on the ſubject. *Tandem ſeſe ars ipſa diſtinxit, et invenit* lumen atque umbras, *differentia colorum alterna vice ſeſe excitante. Dein adjectus eſt ſplendor; alius hic quam lumen; quem quia inter hoc et umbram eſſet, appellaverunt tonon. Commiſſuras vero colorum et tranſitus*, harmogen. The *lumen atque umbras* of this paſſage might have been regarded as merely deſcriptive of the light and ſhade neceſſary to relieve ſingle figures, if it were not for the ſubſequent definition of *tone*. The *harmogen* of Pliny means the *handling* or ſkilful blending and ſoftening colours into one another, rather than what we now call *harmony*.

Lucian †, in his fine deſcription of that ſpirited painting by Zeuxis of the male and female centaurs, after relating the treatment of the ſubject itſelf, proceeds to notice the technical execution of the picture; and he praiſes particularly the truth and delicacy of the drawing, the perfect blending of the colours, the ſkilful ſhading, the ſcientific preſervation of ſize and magnitude, and the equality and harmony of the proportions throughout the whole piece.

Painters, ſays Plutarch, increaſe the effect of the light and ſplendid parts of a picture by the neighbourhood of dark tints and ſhades. And Maximus Tyrius obſerves, that bright and vivid colours are always pleaſant to the eye; but this pleaſure is always leſſened if you omit to accompany them with ſomewhat dark and gloomy. Theſe paſſages ſeem to imply a knowledge of the uſe of cold and dark tints even where a brilliancy of tone is required. The beſt among the ancient painters, however, ſeem to have preferred a chaſte and ſober ſtyle of colouring to the gaudineſs and flutter of the later artiſts.

Upon the whole, therefore, with reſpect to colouring as employed upon ſingle figures, as the ancients were fully as competent to judge of excellence herein as the moderns; as the expreſſions of the ancient connoiſſeurs are very warm in praiſe of the colouring of many of their painters; as they appear alſo to have attended very much to the art of colouring; and, moreover, as probable evidence can be adduced that they attended to miniature painting—a conſiderable degree of merit may be allowed them in the uſe of the colours they poſſeſſed.

Chiaro-

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† In his *Zeuxis*.

Compariſon between the Ancient and Modern.

Compariſon between the Ancient and Modern.

Chiaro-ſcuro, or the art of placing and proportioning light and ſhade in ſuch a manner as to produce a pleaſing effect, independently of any other circumſtance connected with the picture, has been commonly deemed a characteriſtic difference between the knowledge of ancient and modern painters. On this ſubject the works of the ancients now remaining give little or no information; hence Sir Joſhua Reynolds obſerves, "that this, which makes ſo conſiderable a part of the modern art, was to them totally unknown. If the great painters had poſſeſſed this excellence, ſome portion of it would have infallibly been diffuſed, and have been diſcovered, in the works of the inferior rank of artiſts which have come down to us, and which may be conſidered as on the ſame rank with the paintings that ornament our public gardens" But the accounts of the places where theſe paintings have been found, make it evident that they were thus ornamented at a very conſiderable expence. The generality of them conſiſt of ſingle figures; ſome of them of two or three figures, generally relieved by an uniform ground; and, except in a few inſtances, evidently deſigned as mere reliefs to a compartment, and anſwering, as near as may be, the ſtuccoed ornaments in our modern rooms; nor do any of them ſeem the works of artiſts equal in their day to thoſe at preſent employed on the painted cielings of private houſes.

The Abbé du Bos maintains, on the other hand, that what Pliny and other ancient writers ſay concerning the claro-obſcuro and the delightful diſtribution of light and ſhade, is altogether deciſive; and that their writings are full of ſo many probable circumſtances, that it cannot be denied that the ancients at leaſt equalled the moſt celebrated of the moderns in this part of the art.

On the examination of the greater part of the paſſages from antiquity, it is evident that they may relate to the light and ſhade of ſingle figures, without involving what is now called the ſcience of the claro-obſcuro. The paſſage of Pliny, however, already quoted, and ſeveral others, go very near to prove that this branch of painting was underſtood among the ancients. The dark, the light, and mezzotint are evidently and accurately deſcribed in that paſſage.

Equally ſtrong is that expreſſion in Quintilian: *Zeuxis luminum umbrarumque rationem inveniſſe traditur.* This cannot well be otherwiſe tranſlated than by the *ſcience* of light and ſhade.

That ſome technical knowledge of the effect producible by *maſſes* of light and ſhade was poſſeſſed by the ancients, appears indubitable from the paſſages adduced: to what extent it was carried cannot now be aſcertained. In all probability they were much inferior in this reſpect to the moderns; otherwiſe, altho' much ſcience of this kind could hardly be expected from the trifling performances that remain, much more would have occurred on the ſubject, it would have been more largely dwelt on, and more preciſely expreſſed among the obſervations of ancient authors on the beſt paintings of the ancient maſters.

Neither is there ſufficient evidence that the ancients were eminent in that important branch of the compoſition of a picture, which conſiſts in diſtributing the figures and objects in groups or maſſes. There are few examples of this difficult branch of the art among the remaining antiquities; and indeed from the paucity of the figures introduced in the generality of theſe ancient paintings, there is little room to expect them. But what makes it ſtill more doubtful whether the ancients attained any degree of eminence in grouping is, that among the many paintings of theſe great maſters enumerated by Pliny, Lucian, or Philoſtratus, there is none of them praiſed for this ſpecies of excellence. This, however, it muſt be confeſſed, may as well ariſe from want of knowledge in the writer as of ſkill in the artiſt; for in a picture found in Herculaneum, which repreſents in all probability the education of Achilles, the figure of an old man holding a child on his knees, together with that of a woman behind him, form a very agreeable group. A work of the ſame collection, painted in one colour on marble, conſiſts of five figures grouped very much after the modern idea, if it were not that three of the heads are at the ſame height. It is extremely probable, that this morſel had been the copy of a picture finiſhed in the pureſt times of the art. But although it were proved that the ancients did not attempt grouping their figures, it is ſtill uncertain whether this might not ariſe from their peculiar and perhaps excellent taſte in the arts. Wiſhing to enjoy in the fulleſt manner their painted figures as they enjoyed the aſpect of a ſtatue, they took care that every figure ſhould be detached from another in the ſame picture, which permitted them to give their objects more relief, and to render them more diſtinct to the eye of a diſtant ſpectator.

We are not therefore to conclude, that they were entirely ignorant of grouping, on the one hand; or that they declined the execution of it from want of ſkill, on the other. Indeed it actually appears to have been technically attended to by them, whatever might be their comparative excellence in it; for Apelles is expreſsly aſſerted by Pliny to have been inferior to Melanthius in compoſition (*de diſpoſitione*); and one of their paintings, mentioned by the ſame author, is ſaid to have contained one hundred figures; but this unwieldy number muſt have been offenſive, if they were not grouped with ſome ſkill.

From the connection between the ſiſter arts of poetry, painting, and ſculpture, and the admirable performances of the ancients in the other two departments of the fine arts, it is reaſonable to conclude that the ancient painters were not deficient in invention. Many inſtances, were it neceſſary, might be collected in ſupport of their well-founded claim to this branch of the art; but it will be ſufficient to obſerve, that as invention is rather a natural endowment than an acquired talent, and as the ancients univerſally ſeem to be at leaſt equal to the moderns in the gifts of genius and good ſenſe, we cannot but admit, on their part, an equality with ourſelves ſo far as invention is concerned.

Very nearly connected with the ſubject of invention is that of the *coſtume;* by which is meant an attention to probability with reſpect to times, places, objects, perſons, and circumſtances in the tranſaction repreſented.

The ancient paintings now remaining, ſo far from exhibiting any proofs of attention to this important branch of the art, are full of groſs violations of probability,

Compariſon between the Ancient and Modern.

bability, and repreſentations of impoſſible connection. But very little ſtreſs is to be laid on theſe inſtances; firſt, becauſe they are evidently the performances of artiſts of no reputation; ſecondly, becauſe none of them to which this objection can be made are regular repreſentations of any perſon or tranſaction; and thirdly, becauſe, as they were (for the moſt part) manifeſtly intended as ornaments to apartments, the taſte of the owner, and not of the artiſt, would of courſe be chiefly conſulted. Nothing, however, can be more clear than that the ancients required an attention to probability in the works of their artiſts; and from the manner in which their writers expreſs themſelves on the ſubject (not ſo much recommending the practice of it as taking it for granted). we may reaſonably conclude, that their beſt painters were ſeldom guilty of any groſs violation of the coſtume. *Sint ficta ſimillima veris* was an apophthegm generally known, and when known muſt have been univerſally admitted.

The principles of the coſtume are well expreſſed and illuſtrated by Horace in the firſt lines of his Art of Poetry; and Vitruvius, lib. vii. chap. 5. ſays, that no pictures can be approved of which have not a reſemblance to truth and nature. Whether the ancient painters put in practice a greater ſhare of good ſenſe with reſpect to the coſtume than the moderns, cannot now be accurately determined; the advantage ſeems to be in favour of the former: for, as we ſhall have occaſion more particularly to obſerve afterwards, the moſt celebrated of modern painters from Raphael to Sir Joſhua Reynolds have been guilty of ſuch flagrant breaches of probability, as would appear aſtoniſhing to thoſe who are not in the habit of expecting them.

It has been doubted whether the ancients were acquainted with the ſcience of *perſpective*: and if the remains of ancient painting were alone to decide the queſtion, it muſt be determined againſt them: for the works of the ancient painters now in poſſeſſion of the moderns afford no proof of attention to the rules of perſpective equal to the performance of a modern ſign-painter. The picture of the ſacrifice among the Herculanean antiquities, and the fourth of the prints which Bellori has publiſhed and deſcribed, taken from the paintings in the ſepulchre of the Naſonii, are barely tolerable; but the other landſcapes (almoſt the only remaining antique paintings which admit of perſpective) are groſsly defective in this particular; ſo much ſo indeed, that conſidering the late period when landſcape-painting was introduced among the ancients, together with this manifeſt imperfection in point of perſpective of ſuch as are yet extant, we cannot help ſuſpecting the inferiority of the ancients in this reſpect. In perſpective, as in the chiaro-ſcuro, had good practice been common, ſome traces would have been diſcovered in the works of their loweſt artiſts.

And yet ſome general knowledge of the principles, and ſome degree of attention to the practice, of perſpective, cannot well be denied to the ancients. They were good mathematicians, they were excellent architects, and ſome of them are celebrated for their ſkill in ſcene-painting. Geminus the Rhodian, contemporary with Cicero, was the author of an expreſs treatiſe on perſpective; and Euclid, Heliodorus, Lariſſeus, Agatharcus, wrote alſo on the ſame ſubject It is well known, beſides, that the ancients practiſed the art of painting in perſpective on walls in the ſame way that it is now done by the moderns; and Pliny (Nat. Hiſt. lib. xxxv. c. 4.) ſays, that one of the walls of the theatre of Claudius Pulcher, repreſenting a roof covered with tiles, was finiſhed in ſo maſterly a manner, that the rooks, birds of no ſmall ſagacity, taking it for a real roof, attempted to light upon it. We are likewiſe told, that a dog was deceived to ſuch a degree, by certain ſteps in a perſpective of Dantos, that expecting to find a free paſſage, he made up to them in full ſpeed, and daſhed out his brains. But what is ſtill more, Vitruvius tells us in expreſs terms by whom and at what time this art was invented. It was firſt practiſed by Agatharcus, a contemporary of Æſchylus, in the theatre of Athens; and afterwards reduced to certain principles, and treated as a ſcience, by Anaxagoras and Democritus; thus faring like other arts which exiſted in practice before they appeared in theory.

Compariſon between the Ancient and Modern.

Portrait-painting ſeems to have been a principal employment of the firſt artiſt whom the ancients have to boaſt of, ſince Alexander is ſaid to have permitted no painter but Apelles, and no ſculptor but Phidias to take his likeneſs. Pliny particularizes ſeveral inſtances of Apelles as a portrait painter.

In the drawing and colouring of ſingle figures, to which the ancients paid peculiar attention, they muſt be allowed to be equal, if not ſuperior, to the moderns. That ſpirit and animation, eaſe and dignity, were *common* to the performances of ancient artiſts, the ancient ſtatues and paintings ſtill remaining moſt evidently evince; and as they poſſeſſed, therefore, all the requiſites to excel in portrait-painting, a branch of the art at all times much in requeſt among them, there is good reaſon to infer, in favour of the ancients, at leaſt an equality with the moderns in this reſpect.

On the whole, all the principal parts of the art, as purity of deſign, and beauty and expreſſion in the forms, were not only to be found in the ancient ſtatues, but were actually the foundation of excellence in modern painting; and hence we may conclude that their painters formed on the ſame models, and very often the ſame men who excelled in ſculpture, were not inferior in thoſe branches of the art. But with regard to the inferior parts, the allurement of colouring, the ingenuity of the claro-obſcuro, the ſplendor of compoſition, the art of grouping figures, and the nice *handling* of the pencil, the moderns are ſuperior to thoſe ancient painters who have moſt deſerved the notice of their contemporary writers. It is ſtill to be obſerved, however, that the progreſs of the arts among the ancients, from the principal parts to the more ſplendid, was ſomewhat ſimilar to that among the moderns; and as the painters of the firſt rank were more immediately the objects of criticiſm and delight to authors of genius, it is impoſſible at this diſtance of time to ſtate any accurate compariſon between the ancients and moderns in what may be termed the decay of the art. This is particularly the caſe with regard to colours, there being in ancient as well as in modern times two epochs; the one comprehending Polygnotus and his immediate ſucceſſors, and the other the painters both of Greece and Rome after the art began to decay. The colouring of Polygnotus was hard, and his manner had ſomething of wildneſs;

neſs; but his deſign was in the higheſt ſtyle of perfection. In the ſucceeding ages the colouring was more varied, more brilliant, more harmonious, and the handling more agreeable; but the deſign was leſs elegant and exact. And the true connoiſſeurs continued to prefer the works of the ancient ſchool, in the ſame manner that the beſt writers in our times prefer the works of the Roman and Venetian maſters to the more brilliant pictures of their ſucceſſors. From this ſtatement of facts it is abundantly evident, that from the ancient authors we can form ſome compariſon between the beſt ancient and modern painters in thoſe things which are moſt excellent in the art; while in the inferior parts, from the ſilence of authors, and the loſs of paintings, we have no grounds upon which a compariſon can be accurately made.

PART I. Principles of the ART, and the Order of the Artiſt's STUDIES.

WE have joined theſe together, becauſe they are like cauſe and effect; and comprehend both on what parts in the execution of the art the painter is to employ his chief attention, and alſo the manner in which he is to employ it. We ſhall not therefore be confined to the dry and abſtract, and as it were unembodied principles, but connect them with the uſeful and agreeable branches of the art, in that order in which it appears to us they ſhould be ſtudied.

SECT I. *Of Anatomy.*

To aſk if the ſtudy of anatomy is requiſite to a painter, is the ſame thing as to aſk if, in order to learn any ſcience, a man muſt firſt make himſelf acquainted with the principles of it. It would be an uſeleſs waſte of time to cite, in confirmation of this truth, the authorities of the ancient maſters, and the moſt celebrated ſchools. A man, who is unacquainted with the form and conſtruction of the ſeveral bones which ſupport and govern the human frame, and does not know in what manner the muſcles moving theſe bones are fixed to them, can make nothing of what appears of them thro' the integuments with which they are covered; and which appearance is, however, the nobleſt object of the pencil. It is impoſſible for a painter to copy faithfully what he ſees, unleſs he thoroughly underſtand it. Let him employ ever ſo much time and ſtudy in the attempt, it cannot but be attended with many and great miſtakes: juſt as it muſt happen to a man, who undertakes to copy ſomething in a language which he does not underſtand; or to tranſlate into his own, what has been written in another, upon a ſubject with which he is not acquainted.

It ſeldom happens, that nothing more is required of a painter than to copy exactly an object which he has before him. In ſtill and very languid attitudes, in which every member is to appear motionleſs and dead, a living model may, no doubt, yield for a long time a faithful image, and prove an uſeful pattern to him. But in regard to geſtures any way ſudden, motions any way violent, or thoſe momentary attitudes which it is more frequently the painter's buſineſs to expreſs, the caſe is quite different. In theſe a living model can hold but an inſtant or two; it ſoon grows languid, and ſettles into a fixed attitude, which is produced by an inſtantaneous concourſe of the animal ſpirits. If, therefore, a painter poſſeſs not ſo thoroughly all the principles of anatomy, as to be at all times able to have immediate recourſe to them; if he know not the various manners in which the ſeveral parts of the human body play, according to their various poſitions; living models, far from proving an uſeful pattern to him, will rather tend to lead him aſtray, and make him loſe ſight of truth and nature, by exhibiting the very reverſe of what is required, or at leaſt exhibiting it in a very faint and imperfect manner. In living models, we often behold thoſe parts ſlow, which ſhould be very quick; thoſe cold and torpid, which ſhould have the greateſt ſhare of life and ſpirt in them.

Nor is it, as ſome may be apt to imagine, merely to repreſent athletic and vigorous bodies, in which the parts are moſt bold and determined, that anatomy is requiſite; it ſhould be underſtood to repreſent perſons of the moſt delicate frame and condition, even women and children, whoſe members are ſmootheſt and roundeſt, though the parts made known by it are not to be ſtrongly expreſſed in ſuch objects; juſt as logic is equally requiſite under the poliſhed inſinuations of the orator, and the rough arguments of the philoſopher.

But it is needleſs to ſpend much time in proving, that a painter ſhould be acquainted with anatomy; or in ſhowing, how far his acquaintance with it ſhould extend. For inſtance, it is unneceſſary for him to enter into the different ſyſtems of the nerves, blood-veſſels, bowels, and the like; parts which are removed from the ſight, and which therefore may be left to the ſurgeon and the phyſician, as being a guide in the operations of the former and in the preſcriptions of the latter. It is enough for the painter, to be acquainted with the ſkeleton; in other words, with the figure and connection of the bones, which are, in a manner, the pillars and props of the human body; the origin, progreſs, and ſhape, of the muſcles, which cover theſe bones; as alſo the different degrees in which nature has clothed the muſcles with fat, for this ſubſtance lies thicker upon them in ſome places than in others. Above all, he ſhould know in what manner the muſcles effect the various motions and geſtures of the body. A muſcle is compoſed of two tendinous and ſlender parts, one called the *head*, the other the *tail*, both terminating at the bones; and of an intermediate part, called the *belly*. The action of a muſcle conſiſts in an extraordinary ſwelling of this intermediate part, while the head remains at reſt, ſo as to bring the tail nearer the head, and conſequently the part, to which the tail of the muſcle is fixed, nearer to that part into which the head is inſerted.

There are many motions to effect which ſeveral of the muſcles (for this reaſon called *co-operating muſcles*) muſt ſwell and operate together, while thoſe calculated to effect a contrary motion (and therefore called *antagoniſt muſcles*) appear ſoft and flaccid. Thus, for example, the biceps and the brachiæus internus labour when the arm is to be bent, and become more prominent than uſual; while the gemellus, the brachiæus externus, and the anconæus, whoſe office is to extend the arm, continue, as it were, flat and idle. The ſame happens reſpectively in all the other motions of the body. When the antagoniſt muſcles of any part operate at one and the ſame time, ſuch part becomes rigid and motionleſs. This action of the muſcle is called *tonic*.

Michael Angelo intended to give the public a complete treatiſe upon this ſubject; and it is no ſmall misfortune, that he never accompliſhed ſo uſeful a deſign. This great man, having obſerved, as we are told in his life by Condivi, that Albert Durer was deficient on the ſubject, as treating only of the various meaſures and forms of bodies, without ſaying a word of their attitudes and geſtures, though things of much greater importance, reſolved to compoſe a theory, founded upon his long practice, for the ſervice of all future painters and ſtatuaries. And, certainly, no one could be better qualified to give anatomical precepts for that purpoſe, than he who, in competition with Da Vinci, deſigned that famous cartoon of naked bodies, which was ſtudied by Raphael himſelf, and afterwards obtained the approbation of the Vatican, the greateſt ſchool of the art we are now treating of.

The want of Michael Angelo's precepts may, in ſome meaſure, be ſupplied by other books written on the ſame ſubject by Moro, Ceſio, and Tortebat; and lately by Boucherdon, one of the moſt famous ſtatuaries in France. But nothing can be of equal ſervice to a young painter, with the leſſons of ſome able diſſector; under whom, in a few months, he may make himſelf maſter of every branch of anatomy which he need to be acquainted with. A courſe of oſteology is of no great length; and of the infinite number of muſcles diſcovered by curious myologiſts, there are not above 80 or 90, with which nature ſenſibly operates all thoſe motions which he can ever have occaſion to imitate or expreſs. Theſe, indeed, he ſhould cloſely ſtudy, theſe he ſhould carefully ſtore up in his memory, ſo as never to be at the leaſt loſs for their proper figure, ſituation, office, and motion.

But there is another thing, beſides the diſſection of dead bodies, by which a young painter may profit greatly; and that is anatomical caſts. Of theſe we have numbers by ſeveral authors; nay, ſome which paſs under the name of *Buonarroti* himſelf. But there is one in which, above all the reſt, the parts are moſt diſtinctly and lively expreſſed. This is the performance of Hercules Lelli, who has perhaps gone greater lengths in this kind of ſtudy than any other maſter. We have, beſides, by the ſame able hand, ſome caſts of particular parts of the human body, ſo curiouſly coloured for the uſe of young painters, as to repreſent theſe parts exactly as they appear on removing the integuments; and thus, by the difference in their colour as well as configuration, render the tendinous and the fleſhy parts, the belly and the extremities, of every muſcle ſurpriſingly diſtinct; at the ſame time that, by the various direction of the fibres, the motion and play of theſe muſcles become very obvious; a work of the greateſt uſe, and never enough to be commended! Perhaps, indeed, it would be an improvement, to give the muſcles various tints; thoſe muſcles eſpecially which the pupil might be apt to miſtake for others. For example, though the maſtoides, the deltoides, the ſartorius, the faſcia lata, the gaſterocnemii, are, of themſelves, ſufficiently diſtinguiſhable, it is not ſo with regard to the muſcles of the arm and of the back, the right muſcles of the belly, and ſome others, which, either on account of the many parts into which they branch, or of their being interwoven one with another, do not ſo clearly and fairly preſent themſelves to the eye. But let the cauſe of confuſion to young beginners be what it will, it may be effectually removed, by giving, as already hinted, different colours to the different muſcles, and illumining anatomical figures; in the ſame manner that maps are coloured, in order to enable us readily to diſtinguiſh the ſeveral provinces of every kingdom, and the ſeveral dominions of every prince.

The better to underſtand the general effect, and remember the number, ſituation, and play of the muſcles, it will be proper to compare, now and then, the anatomical caſts, and even the dead body itſelf, with the living body covered with its fat and ſkin; and above all things, with the Greek ſtatues ſtill in being. It was the peculiar happineſs of the Greeks, to be able to characterize and expreſs the ſeveral parts of the human body much better than we can pretend to do; and this, on account of their particular application to the ſtudy of naked figures, eſpecially the fine living ones which they had continually before their eyes. It is well known, that the muſcles moſt uſed are likewiſe the moſt protuberant and conſpicuous; ſuch as, in thoſe who dance much, the muſcles of the legs; and in boatmen, the muſcles of the back and arms. But the bodies of the Grecian youth, by means of their conſtant exertion of them in all the gymnaſtic ſports, were ſo thoroughly exerciſed, as to ſupply the ſtatuary with much more perfect models than ours can pretend to be.

There are a great many exerciſes, which a young painter ſhould go through while engaged in the ſtudy of anatomy, in order to make himſelf more thoroughly maſter of that ſcience. For example: The thighs of any figure, a Laocoon for inſtance, being given, he ſhould add to them legs ſuitable to that ſtate in which the muſcles of the thighs are repreſented, that is, the muſcles which ſerve to bend and extend the legs, and to effectuate in them ſuch a preciſe poſition and no other. To the ſimple contour of an anatome, or a ſtatue, he ſhould add the parts included by it, and give it a ſyſtem of muſcles conformable to the quality of that particular contour; for every contour denotes ſome one certain attitude, motion, exertion, and no other. Exerciſes of this kind would ſoon eſtabliſh him in the moſt fundamental principles of painting, eſpecially if he had an opportunity of comparing his drawings with the ſtatue or caſt from which the parts given him to work upon were taken, and thereby diſcovering and correcting his miſtakes. This method is very like that uſed by thoſe who teach the Latin tongue; when, having given their ſcholars a paſſage of Livy or Cæſar already tranſlated into their mother-tongue, to tranſlate back into Latin, they make them compare their work with the original text.

SECT. II. *Of Perſpective.*

THE ſtudy of perſpective ſhould go hand in hand with that of anatomy, as not leſs fundamental and neceſſary. In fact, the contour of an object drawn upon paper or canvas, repreſents nothing more than ſuch an interſection of the viſual rays ſent from the extremities of it to the eye, as would ariſe on a glaſs put in the place of the paper or canvas. Now, the ſituation of an object at the other ſide of a glaſs being given, the delineation of it on the glaſs itſelf depends entirely on the ſituation of the eye on this ſide of the glaſs; that is to ſay, on the rules of perſpective: a ſcience which, contrary to the opinion of moſt people, extends much farther than the painting of ſcenes, floors, and what generally goes under the name of *quadratura*. Perſpective, according to that great maſter da Vinci, is to be conſidered as the reins and rudder of painting. It teaches in what proportion the parts fly from, and leſſen upon, the eye; how figures are to be marſhalled upon a plain ſurface, and fore-ſhortened. It contains, in ſhort, the whole rationale of deſign.

Such are the terms which the maſters beſt grounded in their profeſſion have employed to define and commend perſpective: ſo far were they from calling it a *fallacious art*, and an *inſidious guide*; as ſome amongſt the moderns have not bluſhed to do, inſiſting that it is to be followed no longer than it keeps the high road, or leads by eaſy and pleaſant paths. But theſe writers plainly ſhow, that they are equally ignorant of the nature of perſpective, which, founded as it is on geometrical principles, can never lead its votaries aſtray: and of the nature of their art, which, without the aſſiſtance of perſpective, cannot, in rigour, expect to make any progreſs, nay, not ſo much as to delineate a ſimple contour.

When a painter has formed a ſcene in his mind, and ſuppoſed, as it is cuſtomary, that the capital figures of this ſcene lie cloſe, or almoſt cloſe, to the back of his canvas, he is, in the next place, to fix upon ſome point on this ſide of the canvas, from which he would chooſe his piece ſhould be ſeen. But in chooſing this point, which is called the *point of ſight*, regard ſhould be had to its ſituation to the right or left of the middle of the canvas: but, above all things, to its diſtance and its height with reſpect to the lower edge of the canvas; which edge is called the *baſe line*, and is parallel with the horizontal line that paſſes through the eye. For by aſſuming the point of ſight, and conſequently the horizontal line, too low, the planes upon which the figures ſtand will appear a great deal too ſhallow; as, by aſſuming it too high, they will appear too ſteep, ſo as to render the piece far leſs light and airy than it ought to be. In like manner, if the point of ſight is taken at too great a diſtance from the canvas, the figures will not admit of degradation enough to be ſeen with ſufficient diſtinctneſs; and if taken too near it, the degradation will be too quick and precipitate to have an agreeable effect. Thus, then, it appears, that no ſmall attention is requiſite in the choice of this point.

When a picture is to be placed on high, the point of ſight ſhould be aſſumed low, and *vice verſa*; in order that the horizontal line of the picture may be, as near as poſſible, in the ſame horizontal plane with that of the ſpectator; for this diſpoſition has an amazing effect. When a picture is to be placed very high, as, amongſt many others, that of the Purification by Paolo Veroneſe, engraved by le Fevre, it will be proper to aſſume the point of ſight ſo low, that it may lie quite under the picture, no part of whoſe ground is, in that caſe, to be viſible; for, were the point of ſight to be taken above the picture, the horizontal ground of it would appear ſloping to the eye, and both figures and buildings as ready to tumble head foremoſt. It is true, indeed, that there [illegible] any neceſſity for ſuch extraordinary exactneſs; [illegible] that, unleſs in ſome particular caſes, the point of ſight had better be rather high than low: the reaſon of which is, that, as we are more accuſtomed to behold people on the ſame plane with ourſelves, than either higher or lower, the figures of a piece muſt ſtrike us moſt when ſtanding on a plane nearly level with that upon which we ourſelves ſtand. To this it may be added, that by placing the eye low, and greatly ſhortening the plane, the heels of the back figures will ſeem to bear againſt the heads of the foremoſt, ſo as to render the diſtance between them far leſs perceptible than otherwiſe it would be.

The point of ſight being fixed upon according to the ſituation in which the picture is to be placed, the point of diſtance is next to be determined. In doing this, a painter ſhould carefully attend to three things: firſt, that the ſpectator may be able to take in, at one glance, the whole and every part of the compoſition; ſecondly, that he may ſee it diſtinctly; and, thirdly, that the degradation of the figures and other objects of the picture be ſufficiently ſenſible. It would take up too much time to lay down certain and preciſe rules for doing all this, conſidering the great variety in the ſizes and ſhapes of pictures; for which reaſon we muſt leave a great deal to the diſcretion of the painter.

But there is a point ſtill remaining, which will not admit of the leaſt latitude. This is, the delineation of the picture, when once the point of ſight has been fixed upon. The figures of a picture are to be conſidered as ſo many columns erected on different ſpots of the ſame plane; and the painter muſt not think of deſigning any thing, till he has laid down, in perſpective, all thoſe columns which are to enter his compoſition, with the moſt ſcrupulous exactneſs. By proceeding in this manner, he may not only be ſure of not committing any miſtake in the diminution of his figures according to their different diſtances, but may flatter himſelf with the thoughts of treading in the ſteps of the greateſt maſters. It is to the punctual obſervance of theſe laws, that we are to attribute the grand effect of ſome paintings by Carpaccio and Mantegna, ſo careleſs in other reſpects; whereas a ſingle fault againſt them is often ſufficient entirely to ſpoil the works of a Guido, in ſpite of the ſublimity and beauty of his ſuperior ſtyle.

Now, as the demonſtration of the rules of perſpective depends on the doctrine of proportions, on the properties of ſimilar triangles, and on the interſection of planes, it will be proper to put an abridgement of Euclid into the hands of the young painter, that he may underſtand theſe rules fundamentally, and not ſtand confined to a blind practice of them; but, then, there is nothing in this author relative to the art of painting, which may not be eaſily acquired in a few months. For, as it would be of no uſe to a painter to launch out into the anatomical depths of a Monro or an Albinus, it would be equally ſuperfluous to perplex himſelf with the intricacies of the higher geometry with a Taylor, who has handled perſpective with that rich profoundneſs, which we cannot help thinking does a great deal more honour to a mathematician, than it can poſſibly bring advantage to a ſimple artiſt.

But though a much longer time were requiſite to become a perfect maſter of perſpective, a painter, ſurely, ought not to grudge it; as no time can be too long to acquire that knowledge, without which he cannot poſſibly expect to ſucceed. Nay, we may boldly affirm, that the ſhorteſt road in every art is that which leads through theory to practice. From theory ariſes that great facility, by means of which a man advances the quicker, in proportion as he is ſurer of not taking a wrong ſtep; whilſt thoſe, who are not grounded in the ſcience, labour on in perpetual doubt; obliged, as a certain author expreſſes it, to feel out their way with a pencil, juſt as the blind, with their ſticks, feel for the ſtreets and turnings, with which they are not acquainted.

As practice, therefore, ought in every thing to be built upon principle, the ſtudy of Optics, as far as it is requiſite to determine the degree in which objects are to be illuminated or ſhaded, ſhould proceed hand in hand with that of perſpective: And this, in order that the ſhades, caſt by figures upon the planes on which they ſtand, may fall properly, and be neither too ſtrong nor too light; in a word, that thoſe moſt beautiful effects of the chiaro-ſcuro may run no riſk of ever receiving the lie from truth, which ſooner or later diſcovers itſelf to every eye.

SECT. III. *Of Symmetry.*

The ſtudy of ſymmetry, it is obvious, ſhould immediately follow that of anatomy; for it would avail us little to be acquainted with the different parts of the human body, and their ſeveral offices, were we at the ſame time ignorant of the order and proportion of thoſe parts in regard to the whole in general, and to each other in particular. The Greek ſtatuaries diſtinguiſhed themſelves above all others, as much by the juſt ſymmetry of their members, as by their ſkill in anatomy; but Polycletes ſurpaſſed them all by a ſtatue, called the *Rule*, from which, as from a moſt accurate pattern, other artiſts might take meaſures for every part of the human body. Theſe meaſures, to ſay nothing of the books which treat profeſſedly of them, may now be derived from the Apollo of Belvedere, the Laocoon, the Venus of Medicis, the Faunus, and particularly the Antinous, which laſt was the rule of the learned Pouſſin.

Plinii Nat. Hiſt lib xxxiv. c. 8.

It is the general opinion of painters, that the ancients were not as happy in repreſenting the bodies of children, as they are allowed to have been in repreſenting thoſe of women and men; eſpecially thoſe of their gods; in which they excelled to ſuch a degree, that with theſe gods were often worſhipped the artiſts who had carved them. Yet the Venus of Gnidus by Praxiteles was not more famous than her Cupid, on whoſe account alone people flocked to Theſpiæ §. To children, ſay they, the ancients knew not how to impart that ſoftneſs and effeminacy which Flammingo has ſince contrived to give them, by repreſenting their cheeks, hands, and feet, ſwelled, their heads large, and with ſcarce any belly. But ſuch critics ſeem to forget; that theſe firſt ſketches of nature very ſeldom come in the painter's way, and that this puny and delicate ſtate has not in its form even the leaſt glimmering of perfection. The ancients never undertook to repreſent children leſs than four or five years old; at which age the ſuperfluous humours of the body being in ſome meaſure digeſted, their members begin to aſſume ſuch a coutour and proportion as may ſerve to point out what they are afterwards likely to be. This obſervation is confirmed by the children which we meet with in ancient baſſo-relievos and paintings: for they are all doing one thing or another; like thoſe moſt beautiful little Cupids in a picture at Venice, who are playing with the arms of Mars, and lifting up the ponderous ſword of that Deity; or that little urchin in the Danäe of Caracci, who empties a quiver of its arrows in order to fill it with the golden ſhower. Now, what can be a greater blunder in point of coſtume, than to attribute actions, which require ſome degree of ſtrength and judgment, to infancy, to that raw and tender age ſo totally unable to govern and ſupport itſelf?

Let a young painter conſider the Greek ſtatues ever ſo often, of whatever character or age they may be repreſented, it is impoſſible he ſhould ever conſider them without diſcovering new beauties in them. It is therefore impoſſible he ſhould copy them too often, according to that judicious motto placed by Maratti on his print called *The ſchool.* This truth was acknowledged by Rubens himſelf; for though, like one bred, as he was, in the foggy climate of the Low Countries, he generally painted from the life; in ſome of his works he copied the ancients; nay, he wrote a treatiſe on the excellency of the ancient ſtatues, and on the duty of a painter to ſtudy and imitate them. As to the ſatirical print, or rather paſquinade, of the great Titian, in which he has repreſented a parcel of young monkeys aping the group of Laocoon and his ſons; he intended nothing more by it than to laſh the dulneſs and poverty of thoſe artiſts, who cannot ſo much as draw a figure without having a ſtatue before them as a model.

In fact, reaſon requires, that an artiſt ſhould be ſo much maſter of his art, as ſeldom to ſtand in need of a pattern. To what other purpoſe is he to ſweat and toil from his infancy, and ſpend ſo many days and nights in ſtudying and copying the beſt models; eſpecially the fineſt faces of antiquity, which we are ſtill poſſeſſed of; ſuch as the two Niobes, mother and daughter; the Ariadne, the Alexander, the young Nero, the Silenus, the Nile: and likewiſe the fineſt figures; for inſtance, the Apollo, the Gladiator, the Venus, and others; all which (as was ſaid of Pietro Feſta), he ſhould have, as it were, perfectly by heart! With a ſtock of excellencies like theſe, treaſured up in his memory, he may one day hope to produce ſomething

§ *Cit. in Verrem, de ſignis. Strabo,* lib. ix. *Plin. Nat. Hiſt.* lib. xxxvi. c. 5.

mmetry.

thing of his own without a model; form a right judgement of thoſe natural beauties which fall in his way; and, when occaſion offers, avail himſelf properly of them.

It is very injudicious to ſend boys to an academy to draw after naked figures, before they have imbibed a proper reliſh for beautiful proportions, and have been well-grounded in the true principles of ſymmetry. They ſhould firſt learn, by ſtudying the precious remains of antiquity, to improve upon life; and diſcern where a natural figure is faulty through ſtiffneſs in the members, or clumſineſs in the trunk, or in any other reſpect; ſo as to be able to correct the faulty part, and reduce it to its proper bounds. Painting, in this branch, is, like medicine, the art of taking away and adding.

It muſt not, however, be diſſembled, that the methods hitherto laid down are attended with ſome danger: for by too ſlaviſh an attention to ſtatues, the young painter may contract a hard and dry manner; and by ſtudying anatomies too ſervilely, a habit of repreſenting living bodies as ſtripped of their ſkin: for, after all, there is nothing but what is natural, that, beſides a certain peculiar grace and livelineſs, poſſeſſes that ſimplicity, eaſe, and ſoftneſs, which is not to be expected in the works of art, or even in thoſe of nature when deprived of life. Pouſſin himſelf has now and then given into one of theſe extremes, and Michael Angelo very often into the other: but from this we can only infer, that even the greateſt men are not infallible. It is, in ſhort, to be conſidered as one inſtance, among a thouſand, of the ill uſe thoſe are wont to make of the beſt things, who do not know how to temper and qualify them properly with their contraries.

But no ſuch danger can ariſe to a young painter from confining himſelf for a long time to mere deſign, ſo as not to attempt colouring till he has made himſelf maſter of that branch. If, according to a great maſter *, colours in painting are in regard to the eye what numbers in poetry are in regard to the ear, ſo many charms to allure and captivate that ſenſe; may we not affirm, that deſign is in the ſame art what propriety of language is in writing, and a juſt utterance of ſounds in muſic? Whatever ſome people may think, a picture deſigned according to the rules of perſpective and the principles of anatomy, will ever be held in higher eſteem by good judges, than a picture ill deſigned, let it be ever ſo well coloured. Hannibal Caracci ſet ſo great a value upon the art of contour, that, according to ſome expreſſions of his which have reached us, he conſidered almoſt every thing elſe as nothing in compariſon with it. And this his judgement may be juſtified, by conſidering, that nature, though ſhe forms men of various colours and complections, never operates in the motions contrary to the mechanical principles of anatomy, nor, in exhibiting theſe motions to the eye, againſt the geometrical laws of perſpective: a plain proof, that, in point of deſign, no miſtake is to be deemed trifling. Hence we are enabled to feel all the weight of thoſe words in which Michael Angelo, after he conſidered a picture drawn by a prince of the Venetian ſchool, addreſſed Vaſari: "What a pity it is," ſaid he, "that this man did not ſet out by ſtudying deſign!" As the energy of nature ſhines moſt in the ſmalleſt ſubjects, ſo the energy of art ſhines moſt in imitating them.

Imitation.

SECT. IV. *Of Imitation.*

WHEN you conſider art as the imitation of nature (ſays Mengs), it is not to be underſtood that nature, which is the object, is more perfect than art which imitates it. Nature, it is confeſſed, offers ſome views of which the imitation muſt for ever remain imperfect, as in the inſtance of the claro-obſcuro; but, on the other hand, in every thing relative to beauty of form, imitation may even ſurpaſs nature. Nature, in her productions, is ſubject to many accidents. Art, labouring on paſſive and obedient materials, renders perfect the objects of its creation, chooſes every thing in nature the moſt excellent, and collects the different parts and the different beauties of many individual into one whole. It is ſeldom that we find in the ſame man greatneſs of ſoul and the due proportions of body, vigour, ſuppleneſs, firmneſs, and agility, joined together. Art conſtantly repreſents what is rarely or never to be met with in human nature; regularity in the outlines, grandeur in the forms, grace in the attitudes, beauty in the members, force in the breaſt, agility in the limbs, addreſs in the arms, frankneſs in the forehead, ſpirit in the eyes, and affability over the whole countenance. Let an artiſt give force and expreſſion to all the parts of his ſubject, let him vary this force and expreſſion as different circumſtances make it neceſſary, and he will ſoon perceive that art may ſurpaſs nature. But although this be granted, the artiſt is not to imagine that art is *actually* arrived at this ſupreme degree of perfection, and can proceed no farther. The moderns ſeem never to have perceived the tract pointed out by the ancient Greeks: for, ſince the revival of painting, the true and the agreeable, inſtead of the *beautified*, have been the objects of cultivation. Still, however, imitation is the firſt part of the art of painting, though not the moſt excellent or beautiful. It is a neceſſary ſtep in the progreſs which leads forward to greater perfection.

A painter ought attentively to conſider, compare together, and weigh in the balance of reaſon and truth, all the different ſtyles of the great maſters; but he ought likewiſe carefully to guard againſt too great a fondneſs for any one of them in particular that he may think proper to adopt; otherwiſe, to uſe the expreſſion of a firſt-rate maſter *, inſtead of the child, he would become the grand child of nature.

Beſides, his imitation muſt be of generals, and not of particulars. Whatever a young painter's natural diſpoſition may be, whether to paint boldly and freely like Tintoret and Reubens, or to labour his works like Titian or Da Vinci, let him follow it. This kind of imitation is very commendable. It is thus that Dante, at the ſame time that he carefully avoided adopting the particular expreſſions of Virgil, endeavoured to ſeize his bold and free manner, and at laſt caught from him that elegance of ſtyle which has done him ſo much honour.

As to the reſt, nothing ſhould hinder an able maſter from making uſe now and then of any antique, or even modern figure, which he may find his account in employing. Sanzio, in a *St Paul at Liſtra*, ſcrupled

not

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* Pouſſin, in his *Life* by Bellori.

* *Da Vinci on Painting.*

Imitation.

not to avail himſelf of an ancient ſacrifice in baſſo relievo; nor did Buonarroti himſelf diſdain to uſe, in his paintings of the Sextine chapel, a figure taken from that famous cornelian which tradition tells us he wore on his fingers, and which was lately in the poſſeſſion of the moſt Chriſtian king. Men like theſe avail themſelves of the productions of others in ſuch a manner as to make us apply to them, what La Bruyere ſaid of Deſpreaux, that one would imagine the thoughts of other men had been of his own creation.

In general, a painter ſhould have his eye conſtantly fixed on nature, that inexhauſtible and varied ſource of every kind of beauty; and ſhould ſtudy to imitate her in her moſt ſingular effects. As beauty, ſcattered over the whole univerſe, ſhines brighter in ſome objects than in others, he ſhould never be without his little book and crayon, in order to make drawings of every beautiful or uncommon object that may happen to preſent itſelf; and take ſketches of every fine building, every ſituation, every effect of light, every flight of clouds, every flow of drapery, every attitude, every expreſſion of the paſſions, that may happen to ſtrike him. He may afterwards employ theſe things as occaſion offer; and in the mean time will have the advantage of acquiring a grand taſte.

It is by carefully ſtudying the beſt maſters, and imitating nature, that a painter arrives at the ſtyle of perfection which the Italians call *guſto grando*, the French *le beau ideal*, and the Engliſh *the great ſtyle*.

"A mind (ſays Sir Joſhua Reynolds), enriched by an aſſemblage of all the treaſures of ancient and modern art, will be more elevated and fruitful in reſources in proportion to the number of ideas which have been carefully collected and thoroughly digeſted.

"The addition of other mens judgment is ſo far from weakening, as is the opinion of many, our own, that it will faſhion and conſolidate thoſe ideas of excellence which lay in their birth feeble, ill-ſhaped, and confuſed; but which are finiſhed and put in order by the authority and practice of thoſe, whoſe works may be ſaid to have been conſecrated by having ſtood the teſt of ages.

"When we ſpeak of the habitual imitation and continued ſtudy of maſters, it is not to be underſtood that I adviſe any endeavour to copy the exact peculiar colour and complexion of another man's mind; the ſucceſs of ſuch an attempt muſt always be like his who imitates exactly the air, manner, and geſtures, of him whom he admires. His model may be excellent, but he himſelf will be ridiculous; and this ridicule ariſes not from his having imitated, but from his not having choſen the right mode of imitation.

"It is a neceſſary warrantable pride to diſdain to walk ſervilely behind any individual, however elevated his rank. The true and liberal ground of imitation is an open field, where, though he who precedes has had the advantage of ſtarting before you, yet it is enough to purſue his courſe: you need not tread in his footſteps; and you certainly have a right to outſtrip him if you can.

"Nor, whilſt I recommend ſtudying the art from artiſts, can I be ſuppoſed to mean that nature is to be neglected: I take this ſtudy in aid, and not in excluſion of the other. Nature is, and muſt be, the fountain, which alone is inexhauſtible; and from which all excellencies muſt originally flow.

Colouring.

"The great uſe of ſtudying our predeceſſors is to open the mind, to ſhorten our labour, and to give us the reſult of the ſelection made by thoſe great minds of what is grand or beautiful in nature: her rich ſtores are all ſpread out before us; but it is an art, and no eaſy art, to know how or what to chooſe, and how to attain and ſecure the object of our choice.

"Thus the higheſt beauty of form muſt be taken from nature; but it is an art of long deduction and great experience to know how to find it. I cannot avoid mentioning here an error which ſtudents are apt to fall into.

"He that is forming himſelf muſt look with great caution and warineſs on thoſe peculiarities or prominent parts which at firſt force themſelves on view, and are the marks, or what is commonly called the manner, by which that individual artiſt is diſtinguiſhed.

"Peculiar marks I hold to be generally, if not always, defects, however difficult it may be wholly to eſcape them.

"Peculiarities in the works of art are like thoſe in the human figure; it is by them that we are cognizable and diſtinguiſhed one from another; but they are always ſo many blemiſhes, which, however, both in the one caſe and in the other, ceaſe to appear deformities to thoſe who have them continually before their eyes. In the works of art, even the moſt enlightened mind, when warmed by beauties of the higheſt kind, will by degrees find a repugnance within him to acknowledge any defects; nay, his enthuſiaſm will carry him ſo far as to transform them into beauties and objects of imitation.

"It muſt be acknowledged, that a peculiarity of ſtyle, either from its novelty, or by ſeeming to proceed from a peculiar turn of mind, often eſcapes blame; on the contrary, it is ſometimes ſtriking and pleaſing; but it is vain labour to endeavour to imitate it, becauſe novelty and peculiarity being its only merit, when it ceaſes to be new, it ceaſes to have value.

"A manner, therefore, being a defect, and every painter, however excellent, having a manner, it ſeems to follow, that all kinds of faults as well as beauties may be learned under the ſanction of the greateſt authority."

SECT. V. *Of Colouring.*

COLOURING, though a ſubject greatly inferior to many others which the painter muſt ſtudy, is yet of ſufficient importance to employ a conſiderable ſhare of his attention; and to excel in it, he muſt be well acquainted with that part of optics which has the nature of light and colours for its object. Light, however ſimple and uncompounded it may appear, is nevertheleſs made up, as it were, of ſeveral diſtinct ſubſtances; and the number, and even doſe, of theſe ingredients, has been happily diſcovered by the moderns. Every undivided ray, let it be ever ſo fine, is a little bundle of red, orange, yellow, green, azure, indigo, and violet rays, which, while combined, are not to be diſtinguiſhed one from another, and form that kind of light called *white*: ſo that white is not a colour *per ſe*, as the learned Da Vinci† (ſo far, it ſeems, the precurſor of Newton) expreſsly affirms, but an aſſemblage of colours. Now, theſe colours, which compoſe light, although immutable in themſelves, and endued with various qualities, are continually, however, ſeparating from each other in their reflection from and paſſage through other ſubſtances, and thus become manifeſt to the eye. Graſs, for example, reflects only green rays, or rather reflects green rays in greater number than it does thoſe of any other colour; one kind of wine tranſmits red rays, and another yellowiſh rays: and from this kind of ſeparation ariſes that variety of colours with which nature has diverſified her various productions. Man, too, has contrived to ſeparate the rays of light by making a portion of the ſun's beams paſs through a glaſs priſm; for after paſſing through it, they appear divided into ſeven pure and primitive colours, placed in ſucceſſion one by the other, like ſo many colours on a painter's pallet.

Now, though Titian, Corregio, and Vandyke, have been excellent colouriſts, without knowing any thing of theſe phyſical ſubtleties, that is no reaſon why others ſhould neglect them. For it cannot but be of great ſervice to a painter to be well acquainted with the nature of what he is to imitate, and of thoſe colours with which he is to give life and perfection to his deſigns; not to ſpeak of the pleaſure there is in being able to account truly and ſolidly for the various effects and appearances of light. From a due tempering, for example, and degrading, of the tints in a picture; from making colours partake of each other, according to the reflection of light from one object to another; there ariſes, in ſome meaſure, that ſublime harmony which may be conſidered as the true muſic of the eye. And this harmony has its foundation in the genuine principles of optics. Now this could not happen in the ſyſtem of thoſe philoſophers, who held, that colours did not originally exiſt in light, but were, on the contrary, nothing elſe than ſo many modifications which it underwent in being reflected from other ſubſtances, or in paſſing through them; thus ſubject to alterations without end, and every moment liable to periſh. Were that the caſe, bodies could no more receive any hues one from another, nor this body partake of the colour of that, than ſcarlet, for example; becauſe it has the power of changing into red all the rays of the ſun or ſky which immediately fall upon it, has the power of changing into red all the other rays reflected to it from a blue or any other colour in its neighbourhood. Whereas, allowing that colours are in their own nature immutable one into another, and that every body reflects, more or leſs, every ſort of coloured rays, though thoſe rays in the greateſt number which are of the colour it exhibits, there muſt neceſſarily ariſe, in colours placed near one another, certain particular hues or temperaments of colour: nay, this influence of one colour upon another may be ſo far traced, that three or four bodies of different colours, and likewiſe the intenſeneſs of the light falling upon each, being aſſigned, we may eaſily determine in what ſituations and how much they would tinge each other. We may thus, too, by the ſame principle of optics, account for ſeveral other things practiſed by painters; inſomuch that a perſon, who has carefully obſerved natural effects with an eye directed by ſolid learning, ſhall be able to form general rules, where another can only diſtinguiſh particular caſes.

But after all, the pictures of the beſt colouriſts are, it is univerſally allowed, the books in which a young painter muſt chiefly look for the rules of colouring; that is, of that branch of painting which contributes ſo much to expreſs the beauty of objects, and is ſo requiſite to repreſent them as what they really are. Giorgio and Titian ſeem to have diſcovered circumſtances in nature which others have entirely overlooked; and the laſt in particular has been happy enough to expreſs them with a pencil as delicate as his eye was quick and piercing. In his works we behold that ſweetneſs of colouring which is produced by union, that beauty which is conſiſtent with truth; and all the inſenſible tranſmutations, all the ſoft tranſitions, in a word, all the pleaſing modulations, of tints and colours. When a young painter has, by cloſe application, acquired from Titian, whom he can never ſufficiently dwell upon, that art which, of all painters, he has beſt contrived to hide, he would do well to turn to Baſſano and Paolo, on account of the beauty, boldneſs, and elegance of their touches. That richneſs, ſoftneſs, and freſhneſs of colouring for which the Lombard ſchool is ſo juſtly cried up, may likewiſe be of great ſervice to him. Nor will he reap leſs benefit by ſtudying the principles and practice of the Flemiſh ſchool; which, chiefly by means of her varniſhes, has contrived to give a moſt enchanting luſtre and tranſparency to her colours.

But whatever pictures a young painter may chooſe to ſtudy the art of colouring upon, he muſt take great care that they be well preſerved. There are very few pieces which have not ſuffered more or leſs by the length, not to ſay the injuries, of time; and perhaps that precious patina, which years alone can impart to paintings, is in ſome meaſure akin to that other kind which ages alone impart to medals; inaſmuch as, by giving teſtimony to their antiquity, it renders them proportionably beautiful in the ſuperſtitious eyes of the learned. It muſt indeed be allowed, that if, on the one hand, this patina beſtows, as it really does, an extraordinary degree of harmony upon the colours of a picture, and deſtroys, or at leaſt greatly leſſens, their original rawneſs, it, on the other hand, equally impairs the freſhneſs and life of them. A piece ſeen many years after it has been painted, appears much as it would do, immediately after painting, behind a dull glaſs. It is no idle opinion, that Paolo Veroneſe, attentive above all things to the beauty of his colours, and what is called *ſtrepito*, left entirely to time the care of harmonizing them perfectly, and (as we may ſay) mellowing them. But moſt of the old maſters took that taſk upon themſelves; and never expoſed their works to the eyes of the public, until they had ripened and finiſhed them with their own hands. And who can ſay whether the *Chriſt* of Moneta, or the *Nativity* of Baſſano, have been more improved or injured (if we may ſo ſpeak) by the touchings and retouchings of time, in the courſe of more than two centuries? It is indeed impoſſible to be determined. But the ſtudious pupil may make himſelf ample amends for any injuries which his originals may have received from the hands of time, by turning to truth, and to Nature which never grows old, but conſtantly retains its primitive flower of youth, and was itſelf the model of the models before him. As ſoon, therefore, as a young painter has laid a proper foundation for good colouring, by ſtudying the beſt maſters, he ſhould turn all his thoughts to truth and nature. And it would perhaps be well worth while to have, in the academies of painting, models for colouring as well as deſigning; that as from the one the pupils learn to give their due proportion to the ſeveral members and muſcles, they may learn from the other to make their carnations rich and warm, and faithfully copy the different local hues which appear quite diſtinct in the different parts of a fine body. To illuſtrate ſtill farther the uſe of ſuch a model, let us ſuppoſe it placed in different lights; now in that of the ſun, now in that of the ſky, and now again in that of a lamp or candle; one time placed in the ſhade, and another in a reflected light. Hence the pupil may learn all the different effects of the complection in different circumſtances, whether the livid, the lucid, or tranſparent; and, above all, that variety of tints and half tints, occaſioned in the colour of the ſkin by the epidermis having the bones immediately under it in ſome places, and in others a greater or leſs number of blood-veſſels or quantity of fat. An artiſt who had long ſtudied ſuch a model would run no riſk of degrading the beauties of nature by any particularity of ſtyle, or of giving into that prepoſterous fulneſs and floridneſs of colour which is at preſent ſo much the taſte. He would not feed his figures with roſes, as an ancient painter of Greece ſhrewdly expreſſed it, but with good beef; a difference which the learned eye of a modern writer could perceive between the colouring of Barocci and that of Titian. To practiſe in that manner, is, according to a great maſter, no better than inuring one's ſelf to the commiſſion of blunders. What ſtatues are in deſign, nature is in colouring; the fountain-head of that perfection to which every artiſt, ambitious to excel, ſhould conſtantly aſpire: and accordingly the Flemiſh painters, in conſequence of their aiming ſolely to copy nature, are in colouring as excellent as they are wont to be aukward in deſigning. The beſt model for the tone of colours and the degradation of ſhades is furniſhed by means of the *camera-obſcura*. See DIOPTRICS, Sect. 6th and 9th.

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† *Trattato della Pittura*, c. 14.

Webb, dial. 5.

SECT. VI. *Of Drapery.*

DRAPERY is one of the moſt important branches of the whole art, and accordingly demands the greateſt attention and ſtudy. It ſeldom happens that a painter has nothing but naked figures to repreſent; nay, his ſubjects generally conſiſt of figures clothed from head to foot, Now the flowing of the folds in every garment depends chiefly upon the relief of the parts that lie under it. A certain author, we forget his name, obſerves, that as the inequalities of a ſurface are diſcoverable by the inequalities in the water that runs over it, ſo the poſture and ſhape of the members muſt be diſcernible by the folds of the garment that covers them. Thoſe idle windings and gatherings, with which ſome painters have affected to cover their figures, make the clothes made up of them look as if the body had fled from under them, and left nothing in its place but a heap of empty bubbles, fit emblems of the brain that conceived them. As from the trunk of a tree there iſſue here and there boughs of various forms, ſo from one miſtreſs fold there always flow many leſſer ones: and as it is on the quality of the tree that the elegance, compactneſs, or openneſs of its branches chiefly depends; it is, in like manner, by the quality of the ſtuff of which a garment is made, that the number, order, and ſize of its folds muſt be determined. To ſum up all in two words, the drapery ought to be natural and eaſy, ſo as to ſhow what ſtuff it is, and what parts it covers. It ought, as a certain author expreſſes it, to cover the body, as it were merely to ſhow it.

It was formerly the cuſtom with ſome of our maſters to draw all their figures naked, and then drape them; from the ſame principle that they firſt drew the ſkeletons of their figures, and afterwards covered them with muſcles. And it was by proceeding in this manner that they attained to ſuch a degree of truth in expreſſing the folds of their drapery, and the joints and direction of the principle members that lay under it, ſo as to exhibit in a moſt ſtriking manner the attitude of the perſon to whom they belonged. That the ancient ſculptors clothed their ſtatues with equal truth and grace, appears from many of them that are ſtill in being; particularly a Flora lately dug up in Rome, whoſe drapery is executed with ſo much judgment, and in ſo grand and rich a ſtyle, that it may vie with the fineſt of their naked ſtatues, even with the Venus of Medicis. The ſtatues of the ancients had ſo much beauty when naked, that they retained a great deal when clothed. But here it muſt be conſidered, that it was uſual with them to ſuppoſe their originals clothed with wet garments, and of an extreme fineneſs and delicacy, that, by lying cloſe to the parts, and in a manner clinging to them, they might the better ſhow what theſe parts were. For this reaſon a painter is not to confine himſelf to the ſtudy of the ancient ſtatues, leſt he ſhould contract a dry ſtyle, and even fall into the ſame faults with ſome great maſters who, accuſtomed to drape with ſuch light ſtuffs as fit cloſe to the body, have afterwards made the coarſeſt lie in the ſame manner, ſo as plainly to exhibit the muſcles underneath them. It is therefore proper to ſtudy nature herſelf, and thoſe modern maſters who have come neareſt to her in this branch; ſuch as Paolo Veroneſe, Andrea del Sarto, Rubens, and above all, Guido Reni. The flow of their drapery is ſoft and gentle; and the gatherings and plaits are ſo contrived, as not only not to hide the body, but to add grace and dignity to it. Their gold, ſilk, and woollen ſtuffs, are ſo diſtinguiſhable one from another, by the quality of their ſeveral luſtres, and the peculiar light and ſhade belonging to each, but above all by the form and flow of their folds, that the age and ſex of their figures are hardly more diſcoverable by their faces. Albert Durer is another great maſter in this branch, inſomuch that Guido himſelf was not aſhamed to ſtudy him. There are ſtill extant ſeveral drawings made with the pen by this great man, in which he has copied whole figures from Albert, and ſcrupulouſly retained the flow of his drapery as far as his own peculiar ſtyle, leſs harſh and ſharp, but more eaſy, and graceful, would allow. It may be ſaid that he made the ſame uſe of Albert that our modern writers ought to make of the beſt authors of the 13th century.

To drape a figure well, it is neceſſary that the folds be large and few in number; becauſe large folds produce great maſſes of light and ſhadow, while ſmall ones multiply the objects of view and diſtract the attention. But if the character of the drapery or kind of ſtuff require ſmall folds, they ſhould at leaſt be diſtributed in groups, in ſuch a manner that a great number of ſmall folds ſhall be ſubordinate to an equal maſs formed by a principal fold.

It is alſo proper to obſerve, that the colour of the drapery contributes to the harmony of the whole, and produces effects which the claro obſcuro cannot do alone. At the ſame time, the principles of the claro-obſcuro ſhould preſide over, or at leaſt regulate, the art of drapery. If the folds of the ſtuff which cover the members expoſed to the light are too ſtrongly ſhaded, they will appear to enter into the members, and cut them.

Drapery contributes to the life, to the character, to the expreſſion of the figures, provided all the movements of the folds announce the lively or more tranquil movement of thoſe figures. The colour, and the kind of ſtuff, concur alſo to promote the general expreſſion; brilliant or fine drapery cannot be properly introduced in a mournful ſubject, nor the oppoſite in a gay one.

The drapery muſt alſo agree with the age and character of the figures: And if nature in any inſtance is found to contradict thoſe principles, it is becauſe they relate to the ideal of the art; and it is this ideal which carries it to the greateſt perfection.

Great attention is alſo neceſſary to the ſituation in which the figures are placed, and the actions about which they are employed. If they are in the act of aſcending, a column of air weighs down the drapery; if, on the contrary, they are deſcending, the drapery is ſupported and ſpread out. The folds placed on every member, and the general play of the drapery, ſhould indicate whether the figure is in action or about to be ſo; whether action be beginning or ending; and whether it be ſlow, or quick, or violent. All this is agreeable to nature; but it alſo partakes of the ideal, ſince nature never can be copied in ſuch fluctuating ſituations. The practice of the Roman ſchools, firſt to draw after nature, and then to paint after the drawing, cannot be adopted by colouriſts; becauſe nature, according to the kind of the ſtuffs, produces tones and lights which give more perfection and truth to the work. Meanwhile Raphael, who followed this practice, enjoys the firſt reputation for giving play to his drapery, and diſpoſing the folds in the beſt order. In this part he has even attained the height of ideal beauty. He is the greateſt painter of drapery, as the Venetians are the greateſt in painting ſtuffs.

Raphael, ſays Mengs, imitated at firſt his maſter Perugin's manner of drapery; and he brought this manner to perfection, by ſtudying the works of Maſaccio and of Bartholomew: but he departed entirely from the taſte of the ſchool in which he was educated when he had ſeen the works of the ancients. It was the baſſo-relievo of antiquity which pointed out to him the true flowing of drapery, and he was not backward to introduce it. He diſcovered, by attending to the principles of the ancients, that the naked is the principal part; that drapery is to be regarded altogether as an acceſſory, and that it is intended to cover, not to conceal; that it is employed from neceſſity, not caprice; that of conſequence the clothes ſhould not be ſo narrow as to conſtrain the members, nor ſo ample as to embarraſs them; but that the artiſt ſhould adapt them to the ſize and attitude of the figures intended to wear them.

He underſtood that the great folds ſhould be placed at the large places of the body; and where the nature of the drapery required ſmall folds, that it was neceſſary to give them a projection, which indicates a ſubordination to the principal parts.

He made his ample draperies without uſeleſs folds, and with bendings at the articulations. It was the form of the naked figure which pointed out to him the form of his folds, and on the great muſcles he formed great maſſes. When any part required to be foreſhortened, he covered it with the ſame number of folds as if it had been ſtraight; but then he crowded them in proportion to the foreſhortening.

He frequently diſcovered the border of his drapery, to ſhow that his figures were not dreſſed in a ſimple ſack. The form of the principal parts, and the ſpecific weight of the air, were always the cauſes of his folds. It was eaſy to diſcover in his works, by the folds of his drapery, the attitude of the figure previous to the one in which it was placed; and whether, for example, the arm was extended or otherwiſe, immediately before the action. This was an expreſſion which he had carefully ſtudied on all occaſions, becauſe he found it in nature.

When the drapery was to cover the leg or arm but half, or in an imperfect manner, he made it cut obliquely the member which was partly to be covered. His folds were of a triangular form. The reaſon of this form is in nature; for all drapery has a tendency to enlarge itſelf and be extended; and as at the ſame time its own weight obliges it to fall back on itſelf, it is naturally formed into triangles.

He knew perfectly that the movements of the body and of its members are the cauſes of the actual ſituation of drapery, and of the formation of its folds. All his practice is nothing elſe but the unfolding and demonſtrating of this theory; and drapery executed in any other manner muſt be in a falſe and vicious taſte.

Sect. VII. *Of Landſcape and Architecture.*

When our young painter has made a ſufficient progreſs in thoſe principal branches of his art, the deſigning, perſpective, colouring, and drapery of human figures, he ſhould turn his thoughts to landſcape and architecture: for, by ſtudying them, he will render himſelf univerſal, and qualified to undertake any ſubject; ſo as not to reſemble certain literati, who, though great maſters in ſome articles, are mere children in every thing elſe.

The moſt eminent landſcape painters are Pouſſin, Loreneſe, and Titian.

Pouſſin was remarkable for his great diligence. His pieces are quite exotic and uncommon; being ſet off with buildings in a beautiful but ſingular ſtyle; and

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with learned epiſodes, ſuch as poets reciting their verſes to the woods, and youths exerciſing themſelves in the ſeveral gymnaſtic games of antiquity; by which it plainly appears, that he was more indebted for his ſubjects to the deſcriptions of Pauſanias than to nature and truth.

Lorenese applied himſelf chiefly to expreſs the various phenomena of light, eſpecially thoſe perceivable in the heavens. And thanks to the happy climate of Rome, where he ſtudied and exerciſed his talents, he has left us the brighteſt ſkies, and the richeſt and moſt glorioufly cloud-tipt horizons, that can be well conceived. Nay, the ſun himſelf, which, like the Almighty, can be repreſented merely by his effects, has ſcarce eſcaped his daring and ambitious pencil.

Titian, the great confident of nature, is the Homer of landſcape. His ſcenes have ſo much truth, ſo much variety, and ſuch a bloom in them, that it is impoſſible to behold them, without wiſhing, as if they were real, to make an excurſion into them. And perhaps the fineſt landſcape that ever iſſued from mortal hands, is the back ground of his *Martyrdom of St Peter;* where, by the difference between the bodies and the leaves of his trees and the diſpoſition of their branches, one immediately diſcovers the difference between the trees themſelves; where the different ſoils are ſo well expreſſed, and ſo exquiſitely clothed with their proper plants, that a botaniſt has much ado to keep his hands from them. See Part II. Sect. ii.

Paolo Veroneſe is in architecture what Titian is in landſcape. To excel in landſcape, we muſt, above all things, ſtudy nature. To excel in architecture, we muſt chiefly regard the fineſt works of art; ſuch as the fronts of ancient edifices, and the fabrics of thoſe moderns who have beſt ſtudied and beſt copied antiquity. Next to Brunelleſchi and Alberti, who were the firſt revivers of architecture, came Bramante, Giulio Romano, Sanſovino, Sanmicheli, and laſtly Palladio, whoſe works the young painter ſhould above all the reſt diligently ſtudy and imprint deeply on his mind. Nor is Vignola to be forgot; for ſome think he was a more ſcrupulous copier of antiquity, and more exact, than Palladio himſelf, inſomuch that moſt people conſider him as the firſt architect among the moderns. For our part, to ſpeak of him, not as fame, but as truth ſeems to require, we cannot help thinking, that rather than break through the generality of the rules contrived by him to facilitate practice, he has in ſome inſtances deviated from the moſt beautiful proportions of the antique, and is rather barren in the diſtribution and diſpoſition of certain members. Moreover, the extraordinary height of his pedeſtals and cornices hinders the column from ſhowing in the orders deſigned and employed by him, as it does in thoſe of Palladio. Amongſt that great variety of proportions to be met with in ancient ruins, Palladio has been extremely happy in chooſing the beſt. His profiles are well contraſted, yet eaſy. All the parts of his buildings hang well together. Grandeur, elegance, and beauty, walk hand in hand in them. In ſhort, the very blemiſhes of Palladio, who was no ſlave to conveniency, and ſometimes perhaps was too profuſe in his decorations, are pictureſque. And we may reaſonably believe, that it was by following ſo great a maſter, whoſe works he had continually before his eyes, that Paolo Veroneſe formed that fine and maſterly taſte which enabled him to embelliſh his compoſitions with ſuch beautiful ſtructures.

The ſtudy of architecture cannot fail, in another reſpect, of being very uſeful to the young painter, inaſmuch as it will bring him acquainted with the form of the temples, thermæ, baſilics, theatres, and other buildings of the Greeks and Romans. Beſides, from the baſſo-relievos with which it was cuſtomary to adorn theſe buildings, he may gather, with equal delight and profit, the nature of their ſacrifices, arms, military enſign, and dreſs. The ſtudy of landſcape, too, will render familiar to him the form of the various plants peculiar to each ſoil and climate, and ſuch other things as ſerve to characteriſe the different regions of the earth. Thus by degrees he will learn what we call *coſtume,* one of the chief requiſites in a painter; ſince by means of it he may expreſs with great preciſion the time and place in which his ſcenes are laid.

Expreſſion of the Paſſions.

SECT. VIII. *Of the Expreſſion of the Paſſions.*

THAT language which above all others a painter ſhould carefully endeavour to learn, and from nature herſelf, is the language of the paſſions. Without it the fineſt works muſt appear lifeleſs and inanimate. It is not enough for a painter to be able to delineate the moſt exquiſite forms, give them the moſt graceful attitudes, and compoſe them well together; it is not enough to dreſs them out with propriety, and in the moſt beautiful colours; it is not enough, in fine, by the powerful magic of light and ſhade, to make the canvas vaniſh. No; he muſt likewiſe know how to clothe his figures with grief, with joy, with fear, with anger; he muſt, in ſome ſort, write on their faces what they think and what they feel; he muſt give them life and ſpeech. It is indeed in this branch that painting truly ſoars, and in a manner riſes ſuperior to itſelf; it is in this branch ſhe makes the ſpectator apprehend much more than what ſhe expreſſes.

The means employed in her imitations by painting, are the circumſcription of terms, the chiaro-ſcuro, and colours; all which appear ſolely calculated to ſtrike the viſual faculty. Notwithſtanding which, ſhe contrives to repreſent hard and ſoft, rough and ſmooth ſurfaces, which are objects of the touch: and this by means of certain tints, and a certain chiaro-ſcuro, which has a different book in marble, in the bark of trees, in downy and delicate ſubſtances. Nay, ſhe contrives to expreſs ſound and motion, by means of light and ſhade, and certain particular configurations. In ſome landſcapes of Diderich, we almoſt hear the water murmur, and ſee it tremble along the ſides of the river and of the boats upon it. In the *Battle* of Burgogne, we are really apt to fancy that the trumpet ſounds; and we ſee the horſe, who has thrown his rider, ſcamper along the plain. But what is ſtill more wonderful, painting, in virtue of her various colours and certain particular geſtures, expreſſes even the ſentiments and moſt hidden affections of the ſoul, and renders her viſible, ſo as to make the eye not only touch and hear, but even kindle into paſſion and reaſon.

Many have written, and amongſt the reſt the famous Le Brun, on the various changes that, according to the various paſſions, happen in the muſcles of the face, which is, as it were, the dumb tongue of the ſoul.

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They obſerve, for example, that in fits of anger the face reddens, the muſcles of the lips puff out, the eyes ſparkle; and that, on the contrary, in fits of melancholy, the eyes grow motionleſs and dead, the face pale, and the lips ſink in. It may be of ſervice to a painter to read theſe and ſuch other remarks; but it will be of infinitely more ſervice to ſtudy them in nature itſelf, from which they have been borrowed, and which exhibits them in that lively manner which neither tongue nor pen can expreſs.

Upon Le Brun's Treatiſe on the Paſſions, we have the following juſt, though ſevere, criticiſm by Winckleman. "Expreſſion, though precarious in its nature (ſays he), has been reduced into a ſyſtem, in a Treatiſe on the Paſſions by Charles le Brun, a work generally put into the hands of young artiſts. The plates which accompany this treatiſe do not only give to the face the affections of the ſoul in too high a tone, but there are many of the heads in which the paſſions are repreſented in an outrageous manner. He appears to give inſtructions in expreſſion, as Diogenes gave examples of morality; I act like muſicians, ſaid that cynic, who give a high tone, in order to indicate a true one. But the fervour of youth has naturally more inclination to ſeize the extreme than the middle; and hence it is difficult for the young artiſt, in copying after Le Brun, to ſeize the true tone. Youth in general may be ſuppoſed to have that regard for the calm and moderate in the arts, which they have for the precepts of wiſdom and virtue."

Other French writers have given inſtructions reſpecting the expreſſion of the paſſions, equally exceptionable with thoſe of Le Brun. All of them whom we have conſulted make ſo many diviſions and ſubdiviſions of paſſions, that a philoſopher cannot follow them in metaphyſical theory, nor a painter exhibit their effects upon canvas. Nature therefore muſt be his guide, particularly in treating thoſe very minute and almoſt imperceptible differences, by which, however, things very different from each other are often expreſſed. This is particularly the caſe with regard to the paſſions of laughing and crying; as in theſe, however contrary, the muſcles of the face operate nearly in the ſame manner. As the famous Pietro de Cortona was one day finiſhing the face of a crying child in a repreſentation of the Iron Age, with which he was adorning the floor called the *Hot-bath* in the royal palace of Pitti, Ferdinand II. who happened to be looking over him for his amuſement, could not forbear expreſſing his approbation, by crying out, "Oh how well that child cries!" To whom the artiſt,—"Has your majeſty a mind to ſee how eaſy it is to make children laugh? Behold, I'll prove it in an inſtant:" And taking up his pencil, by giving the contour of the mouth a concave turn downwards inſtead of the convex upwards which it before had, and with little or no alteration in any other part of the face, he made the child, who a little before ſeemed ready to burſt its heart with crying, appear in equal danger of burſting its ſides with immoderate laughter; and then, by reſtoring the altered features to their former poſition, he ſoon ſet the child a-crying again."

Lectures of Philip Baldinucci in the Academy of La Cruſca il Lyſtrato, &c.

The different expreſſions of laughter and weeping are thus deſcribed by Le Brun. "The movements of laughter are expreſſed by the eye-brows elevated towards the middle of the eye, and lowered towards the ſides of the noſe; the eyes, almoſt ſhut, appear ſometimes moiſtened with tears: the mouth, a little open, allows the teeth to be ſeen: the extremities of the mouth drawn back, make a dimple in the cheeks, which appear to be ſwelled: the noſtrils are open: and the face becomes red. The changes which weeping occaſions are equally viſible. The eye-brow is lowered on the middle of the forehead; the eyes are almoſt ſhut, moiſtened, and lowered towards the ſides of the cheeks: the noſtrils are ſwelled, and the veins of the forehead very apparent: the mouth ſhut, by the lowneſs of its ſides, occaſions wrinkles in the cheeks; the under lip is turned down, and preſſes at the ſame time the upper lip: the whole countenance is wrinkled and becomes red; eſpecially the eye-brows, the eyes, the noſe, and the cheeks."

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According to Leonardo da Vinci, the beſt maſters that a painter can have recourſe to in this branch are thoſe dumb men who have found out the method of expreſſing their ſentiments by the motion of their hands, eyes, eye-brows, and in ſhort every other part of the body. If this advice be at all proper, ſuch geſtures muſt be imitated with great ſobriety and moderation, leſt they ſhould appear too ſtrong and exaggerated; and the piece ſhould ſhow nothing but pantomimes, when ſpeaking figures alone are to be exhibited; and ſo become theatrical and ſecond-hand, or, at beſt, look like the copy of a theatrical and ſecond-hand nature.

The artiſt will reap greater benefit from ſtudying ſuch fine ancient heads as thoſe of Mithridates, Seneca, Alexander dying, Cleopatra, Niobe, &c. and above all, from attentively obſerving ſuch movements of nature as we daily meet with in the world. But let him chiefly conſult his looking-glaſs, and ſtudy after his own face, what, in certain expreſſions, are the muſcles, the lineaments, the tints, and the accidental circumſtances which characteriſe the ſituation of the ſoul. It rarely happens that a model, which is affected with no ſentiment, preſents that to us which we ourſelves feel, and which we are capable of expreſſing when we are our own model. Puget executed the legs of his Milo after his own; and many ingenious artiſts have had recourſe to a ſimilar expedient. In ſhort, to be affected ourſelves is the true ſecret of affecting the ſpectator.

We muſt not neglect, at the ſame time, to ſecure the fleeting characters which nature preſents to us on a thouſand occaſions. We muſt diſtruſt our memory, and all the reſources which are not eaſily employed when we happen to ſtand in need of them. It is neceſſary to watch the circumſtances from which we can derive any uſeful hint; to ſeize them when they preſent themſelves; and to be careful never to loſe, by an irreparable negligence, the fruit of a happy incident.

Let us alſo endeavour to poſſeſs the feeling of what we are to expreſs; whether it be by forming the image of a thing abſent as if it were preſent, or by being affected with the lively idea of a ſituation which we have either experienced, or with which we have ſeen another perſon remarkably affected. We muſt never forget, that all the terrible or agreeable, the violent or ſlight movements, are to be treated in a natural manner, and bear a relation to the age, condi-

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tion, ſex, and dignity of the perſon. Thoſe gradations, which art varies according to the nature of the ſituation, and the character of men, compoſe the principal ingredients of diſcernment, knowledge, and taſte. They have been the objects of attention and inquiry to the moſt eminent painters of every age; and they were of the laſt importance in aſſiſting them to arrive at that degree of excellence to which they have carried expreſſion.

We are told ſtrange things of the ancient painters of Greece in regard to expreſſion; eſpecially of Ariſtides; who, in a picture of his, repreſenting a woman wounded to death at a ſiege, with a child crawling to her breaſt, makes her appear afraid, leſt the child, when ſhe was dead, ſhould, for want of milk, ſuck her blood. *A Medea murdering her children*, by Timomachus, was likewiſe much cried up, as the ingenious artiſt contrived to expreſs, at once, in her countenance, both the fury that hurried her on to the commiſſion of ſo great a crime, and the tenderneſs of a mother that ſeemed to with-hold her from it. Rubens attempted to expreſs ſuch a double effect in the face of Mary of Medicis, ſtill in pain from her paſt labour, and at the ſame time full of joy at the birth of a Dauphin. And in the countenance of Sancta Polonia, painted by Tiepolo for St Anthony's church at Padua, one may clearly read a mixture of pain from the wound given her by the executioner, and of pleaſure from the proſpect of paradiſe opened to her by it.

Few, to ſay the truth, are the examples of ſtrong expreſſion afforded by the Venetian, Flemiſh, or Lombard ſchools. Deprived of that great happineſs, the happineſs of being able to contemplate, at leiſure, the works of the ancients, the pureſt ſources of perfection in point of deſign, expreſſion, and character; and having nothing but nature conſtantly before their eyes; they made ſtrength of colouring, blooming complections, and the grand effects of the chiaro-obſcuro, their principal ſtudy: they aimed more at charming the ſenſes than at captivating the underſtanding. The Venetians, in particular, ſeem to have placed their whole glory in ſetting off their pieces with all that rich variety of perſonages and dreſs, which their capital is continually receiving by means of its extenſive commerce, and which attracts ſo much the eyes of all thoſe who viſit it. It is much to be doubted, if, in all the pictures of Paolo Veroneſe, there is to be found a bold and judicious expreſſion, or one of thoſe attitudes which, as Petrach expreſſes it, ſpeak without words; unleſs, perhaps, it be that remarkable one in his *Marriage Feaſt of Cana of Galilee*. At one end of the table, and directly oppoſite to the bridegroom, whoſe eyes are fixed upon her, there appears a woman in red, holding up to him the ſkirt of her garment; as much as to ſay, we may ſuppoſe, that the wine miraculouſly produced was exactly of the colour with the ſtuff on her back. And in fact it is red wine we ſee in the cups and pitchers. But all this while the faces and attitudes of moſt of the company betray not the leaſt ſign of wonder at ſo extraordinary a miracle. They all, in a manner, appear intent upon nothing but eating, drinking, and making merry. Such, in general, is the ſtyle of the Venetian ſchool. The Florentine, over which Michael Angelo preſided, above all things curious of deſign, was moſt minutely and ſcrupulouſly exact in point of anatomy. On this ſhe ſet her heart, and took ſingular pleaſure in diſplaying it. Not only elegance of form, and nobleneſs of invention, but likewiſe ſtrength of expreſſion, triumph in the Roman ſchool, nurſed as it were amongſt the works of the Greeks, and in the boſom of a city which had once been the ſeminary of learning and politeneſs. Here it was that Domenichino and Pouſſin, both great maſters of expreſſion, refined themſelves, as appears more particularly by the *St Jerome* of the one, and the *Death of Germanicus*, and the *Slaughter of the Innocents*, by the other. Here it was that Raphael aroſe, the ſovereign maſter of them all One would imagine, that pictures, which are generally conſidered as the books of the ignorant, and of the ignorant only, he had undertaken to make the inſtructors even of the learned. One would imagine, that he intended, in ſome meaſure, to juſtify Quintilian*, who affirms, that painting has more power over us than all the arts of rhetoric. There is not, indeed, a ſingle picture of Raphael's, from the ſtudy of which thoſe who are curious in point of expreſſion may not reap great benefit; particularly his *Martyrdom of St Felicitas*, his *Transfiguration*; his *Joſeph explaining to Pharoah his dream*, a piece ſo highly rated by Pouſſin His *School of Athens*, in the Vatican, is, to all intents and purpoſes, a ſchool of expreſſion. Among the many miracles of art with which this piece abounds, we ſhall ſingle out that of the four boys attending on a mathematician, who, ſtooping to the ground with his compaſſes in his hand, is giving them the demonſtration of a theorem. One of the boys, recollecting within himſelf, keeps back, with all the appearance of profound attention to the reaſoning of the matter; another, by the briſkneſs of his attitude, diſcovers a greater quickneſs of apprehenſion; while the third, who has already ſeized the concluſion, is endeavouring to beat it into the fourth, who, ſtanding motionleſs, with open arms, a ſtaring countenance, and an unſpeakable air of ſtupidity in his looks, will never perhaps be able to make any thing of the matter. And it is probable from this very group that Albani, who ſtudied Raphael ſo cloſely, drew the following precept of his: "That it behoves a painter to expreſs more circumſtances than one by every attitude; and ſo to employ his figures, that, by barely ſeeing what they are actually about, one may be able to gueſs, both what they have been already doing, and are next going to do." This is indeed a difficult precept; but it is only by a due obſervance of it that the eye and the mind can be made to hang in ſuſpence on a painted piece of canvas. It is expreſſion that a painter, ambitious to ſoar in his profeſſion, muſt, above all things, labour to perfect himſelf in. It is the laſt goal of his art, as Socrates proves to Parrhaſius. It is in expreſſion that dumb poetry conſiſts, and what the prince of our poets calls a viſible language.

Sect. IX. *Of Invention.*

As the operations of a general ſhould all ultimately tend to battle and conqueſt, ſo ſhould all the thoughts of a painter to perfect invention. Now, the ſtudies which we have been hitherto recommending, will prove ſo many wings by which he may raiſe himſelf, as it were, from the ground, and ſoar on high, when

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* *Inſtit.* lib. xi. cap. 3.

Xenoph. Memorab. lib. iii.

when deſirous of trying his ſtrength this way, and producing ſomething from his own hand. Invention is the finding out probable things, not only ſuch as are adapted to the ſubject in hand, but ſuch, beſides, as by their ſublimity and beauty are moſt capable of exciting ſuitable ſentiments in the ſpectator, and of making him, when they happen to be well executed, fancy that it is the ſubject itſelf in its greateſt perfection, and not a mere repreſentation of it, that he has before him. We do not ſay true things, but probable things; becauſe probability or veriſimilitude is, in fact, the truth of thoſe arts which have the fancy for their object. It is, indeed, the buſineſs and duty of both naturaliſts and hiſtorians to draw objects as they find them, and repreſent them with all thoſe imperfections and blemiſhes, to which, as individuals, they are ſubject. But an ideal painter, and ſuch alone is a true painter, reſembles the poet: inſtead of copying, he imitates: that is, he works with his fancy, and repreſents objects endued with all that perfection which belongs to the ſpecies, and may be conceived in the archetype.

"'Tis nature all, but nature methodis'd;"

ſays an eminent poet, ſpeaking of poetry: And the ſame may be ſaid of painting; it is nature methodized, and made perfect. Inſomuch, that the circumſtances of the action, exalted and ſublimed to the higheſt degree of beauty and boldneſs they are ſuſceptible of, may, though poſſible, have never happened exactly ſuch as the painter fancies and thinks proper to repreſent them. Thus, the piety of Æneas, and the anger of Achilles, are things ſo perfect in their kind, as to be merely probable. And it is for this reaſon that poetry, which is only another word for invention, is more philoſophical, more inſtructive, and more entertaining, than hiſtory.

Here it is proper to obſerve, what great advantages the ancient had over the modern painters. The hiſtory of the times they lived in, fraught with great and glorious events, was to them a rich mine of the moſt noble ſubjects, which, beſides, often derived no ſmall ſublimity and pathos from the mythology upon which their religion was founded. So far were their gods from being immaterial, and placed at an infinite diſtance above their worſhippers; ſo far was their religion from recommending humility, penance, and ſelf-denial, that, on the contrary, it appeared calculated merely to flatter the ſenſes, inflame the paſſions, and poiſon the fancy. By making the gods partake of our nature, and ſubjecting them to the ſame paſſions, it gave man hopes of being able to mix with thoſe who, though greatly above him, reſembled him, notwithſtanding, in ſo many reſpects. Beſides, thoſe deities of theirs were in a manner viſible, and to be met at every ſtep. The ſea was crowded with Tritons and Nereids, the rivers with Naiads, and the mountains with Dryads. The woods ſwarmed with Fauns and Nymphs, who, in theſe obſcure retreats, ſought an aſylum for their ſtolen embraces. The moſt potent empires, the moſt noble families, the moſt celebrated heroes, all derived their pedigree from the greater divinities. Nay, gods intereſted themſelves in all the concerns of mankind. Apollo, the god of long arrows, ſtood by the ſide of Hector in the fields of Troy, and inſpired him with new ſtrength and courage to batter down the walls and burn the ſhips of the Greeks. Theſe, on the other hand, were led on to the fight and animated by Minerva, preceded by Terror, and followed by Death. Jove nods, his divine locks ſhake on his immortal head; Olympus trembles. With that countenance, which allays the tempeſt, and reſtores ſerenity to the heavens, he gathers kiſſes from the mouth of Venus, the delight of gods and of men. Among the ancients, every thing ſported with the fancy; and in thoſe works which depend entirely on the imagination, ſome of our greateſt maſters have thought they could not do better than borrow from the Pagans, if we may be allowed to ſay it, their pictures of Tartarus, in order to render their own drawings of hell more ſtriking.

After all, there have not been wanting able inventors in painting among the moderns. Michael Angelo, notwithſtanding the depth and boldneſs of his own fancy, is not aſhamed in ſome of his compoſitions, to *Dantize*; as Phidias and Apelles may be ſaid formerly to have *Homerized*. Raphael, too, tutored by the Greeks, has found means, like Virgil, to extract the quinteſſence of truth; has ſeaſoned his works with grace and nobleneſs, and exalted nature, in a manner, above herſelf, by giving her an aſpect more beautiful, more animating, and more ſublime, than ſhe is in reality accuſtomed to wear. In point of invention, Domenichino and Hannibal Caracci come very near Raphael, eſpecially in the pieces painted by them in Rome; nor does Pouſſin fall very ſhort of him in ſome of his pictures, particularly in his *Eſther before Ahaſuerus*, and his *Death of Germanicus*, the richeſt jewel belonging to the Barberine family. Of all the painters who have acquired any extraordinary degree of reputation, no one ſtudied leſs to ſet off his pieces by bold and beautiful circumſtances, or was more a ſtranger to what is called *poetical perfection*, than Jacopo Baſſano. Among the numberleſs inſtances we could produce of his careleſſneſs this way, let it ſuffice to mention a *Preaching of St Paul* painted by him in a place, near that of his birth, called *Maroſtego*. Inſtead of repreſenting the apoſtle full of a divine enthuſiaſm, as Raphael has done, and thundering againſt the ſuperſtitions of the heathen in an aſſembly of Athenians; inſtead of exhibiting one of his auditors ſtruck to the quick, another perſuaded, a third inflamed; he makes him hold forth, in a village of the Venetian ſtate, to a parcel of poor peaſants and their wives, who take not the leaſt notice of him; the women eſpecially, who ſeem to mind nothing but the country labours in which he had found them employed.

With regard to invention, painting and poetry reſemble each other ſo much in many other reſpects, beſides that of combining in every action all the beauty and elegance it will admit, that they well deſerve the name of *ſiſter arts*. They differ, however, in one point, and that too of no ſmall importance. It is this. The poet, in the repreſentation of his ſtory, relates what has already happened, prepares that which is ſtill to come, and ſo proceeds, ſtep by ſtep, through all the circumſtances of the action; and, to produce the greater effect on his hearers, avails himſelf of the ſucceſſion of time and place. The painter, on the contrary, deprived of ſuch helps, muſt be content to depend upon one ſingle moment. But what a moment! A moment, in which he may conjure up, at once, to the eyes of the ſpectator, a thouſand objects; a moment, teeming with the moſt beautiful circumſtances that can attend the action; a moment, equivalent to the ſucceſſive labours of the poet. This the works of the greateſt maſters, which are everywhere to be ſeen, ſufficiently evince: among others, the *St Paul at Lyſtra*, by Raphael, whom it is impoſſible not to praiſe as often as this picture is mentioned. In order to give the ſpectator a thorough inſight into the ſubject of this piece, the painter has placed, in the front of it, the cripple, already reſtored to his limbs by the apoſtle, fired with gratitude towards his benefactor, and exciting his countrymen to yield him all kinds of honour. Round the cripple are ſome figures lifting up the ſkirts of his coat, in order to look at the legs reduced to their proper ſhape, and acknowledging by geſtures full of aſtoniſhment the reality of the miracle; an invention, ſays a certain author, a profeſſed admirer of antiquity, which might have been propoſed as an example in the happieſt age of Greece.

Webb, dia. 7.

We have another ſhining inſtance of the power of painting to introduce a great variety of objects on the ſcene at the ſame time, and of the advantage it has in this reſpect over poetry, in a drawing by the celebrated La Fage. This drawing repreſents the deſcent of Æneas into hell. The field is the dark caverns of Pluto's kingdom, through the middle of which creeps ſlowly the muddy and melancholy Acheron. Nearly in the centre of the piece appears Æneas with the golden bough in his hand, and with an air of aſtoniſhment at what he ſees. The Sybil, who accompanies him, is anſwering the queſtions which he aſks her. The perſonage there is the ferryman of the pitchy lake, by which even the gods themſelves are afraid to ſwear. Thoſe who, crowding in to the banks of the river, numberleſs as the leaves ſhaken off the trees by autumnal blaſts, expreſs, with outſtretched hands, an impatience to be ferried to the oppoſite ſhore, are the unhappy manes, who, for want of burial, are unqualified for that happineſs. Charon, accordingly, is crying out to them, and with his lifted-up oar driving them from his boat, which has already taken in a number of thoſe who had been honoured with the accuſtomed funeral rites. Behind Æneas and the Sybil we diſcover a confuſed group of wretched ſouls, lamenting bitterly their misfortune in being denied a paſſage; two of them wrapped up in their clothes; and, in a fit of deſpair, ſunk upon a rock. Upon the firſt lines of the piece ſtands a third group of uninhumed ſhades. Leucaſpes, Orontes, and, in the midſt of them, the good old Palinurus, formerly maſter and pilot of the hero's own veſſel, who with joined hands moſt earneſtly deſires to be taken along with him into the boat, that, after death, at leaſt, he may find ſome repoſe, and his dead body no longer remain the ſport of winds and waves. Thus, what we ſee ſcattered up and down in many verſes by Virgil, is here, as it were, gathered into a focus, and concentered by the ingenious pencil of the painter, ſo as to form a ſubject well worthy of being expoſed, in more ſhapes than one, to the eyes of the public.

When a painter takes a ſubject in hand, be it hiſtorical, be it fabulous, he ſhould carefully peruſe the books which treat of it, imprint well on his mind all the circumſtances that attend it, the perſons concerned in it, and the paſſions with which they muſt have been ſeverally animated; not omitting the particulars of time and place. His next buſineſs is to create it, as it were, anew, obſerving the rules already laid down for that purpoſe: From what is true, chooſing that which is moſt ſtriking; and clothing his ſubject with ſuch acceſſory circumſtances and actions, as may render it more conſpicuous, pathetic, and noble, and beſt diſplay the powers of the inventive faculty. But, in doing this, great diſcretion is requiſite; for, let his imagination grow ever ſo warm, his hand is never to execute any thing that is not fully approved by his judgement. Nothing low or vulgar ſhould appear in a lofty and noble argument; a fault, of which ſome of the greateſt maſters, even Lampieri and Pouſſin, have been now and then guilty.

The action muſt be one, the place one, the time one. We need not ſay any thing of thoſe painters, who, like the writers of the Chineſe and Spaniſh theatre, cram a variety of actions together, and ſo give us at once, the whole life of a man. Such blunders, it is preſumed, are too groſs to be feared at preſent. The politeneſs and learning of the age ſeem to demand conſiderations of a more refined nature; ſuch as, that the epiſodes introduced in the drama of a picture, the better to fill and adorn it, ſhould be not only beautiful in themſelves, but indiſpenſably requiſite. The games celebrated at the tomb of Anchiſes, in Sicily, have a greater variety in them, and more ſources of delight, than thoſe that had been before celebrated at the tomb of Patroclus under the walls of Troy. The arms forged by Vulcan for Æneas, if not better tempered, are at leaſt better engraved, than thoſe which the ſame god had forged ſeveral ages before for Achilles. Nevertheleſs, in the eyes of judges, both the games and the arms of Homer are more pleaſing than thoſe of Virgil, becauſe the former are more neceſſary in the Iliad than the latter in the Æneid. Every part ſhould agree with, and have a relation to, the whole. Unity ſhould reign even in variety; for in this beauty conſiſts. This is a fundamental maxim in all the arts whoſe object it is to imitate the works of nature.

Pictures often borrow no ſmall grace and beauty from the fictions of poetry. Albani has left us, in ſeveral of his works, ſufficient proofs of the great ſhare the belles lettres had in refining his taſte. But Raphael, above all others, may in this branch too be conſidered as a guide and maſter. To give but one inſtance out of many; what a beautiful thought was it to repreſent the river himſelf, in a *Paſſage of Jordan*, ſupporting his waters with his own hands, in order to open a way to the army of the Iſraelites! Nor has he diſplayed leſs judgment in reviving, in his deſigns engraved by Agoſtino of Venice, the little loves of Aëtius playing with the arms of Alexander, conquered by the beauty of Roxana.

Among the ancients, Apelles and Parrhaſius were thoſe who diſtinguiſhed themſelves moſt in allegorical ſubjects, in which the inventive faculty ſhows itſelf to the greateſt advantage; the firſt by his picture of *Calumny* *, the ſecond by that of the *Genius of the Athenians* †. The ancient painter called *Galaton* gave likewiſe a fine proof of his genius in this branch, by repreſenting a great number of poets greedily quenching their thirſt in the waters guſhing from the mouth of the ſublime Homer. And to this allegory, according to Guigni, Pliny* has an eye, when he calls that prince of poets the *fountain of wits*. But it is, after all, no way ſurpriſing that we ſhould often meet ſuch fine flights of fancy in the ancient artiſts. They were not guided in their works by a blind practice: they were men of polite education; converſant with the letters of the age in which they lived; and the companions rather than the ſervants of the great men who employed them. The fineſt allegorical painter among the moderns was Rubens; and he was accordingly much celebrated for it. The beſt critics, however, find fault with his uniting in the Luxemberg gallery, the queen-mother, in council, with two cardinals and Mercury. Nor is there leſs impropriety in his making Tritons and Nereids, in another piece of the ſame gallery, ſwim to the queen's veſſel through the galleys of the knights of St Stephen. Such freedoms are equally diſguſting with the prophecies of Sannazaro's Proteus, concerning the myſtery of the incarnation, or the Indian kings of Camoens, reaſoning with the Portugueſe on the adventures of Ulyſſes.

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* See *Lucian* upon Calumny; and *Carlo Dati*, in the *Life of Apelles*, note 20.

† *C Plinii Nat. Hiſt.* lib. xxxv. c. 10.

Webb, dial. 4.

Polym. dial. 18.

The beſt modern performances in pictureſque allegory are certainly thoſe of Pouſſin; who availed himſelf, with great diſcretion and judgment, of the vaſt treaſures with which, by a cloſe ſtudy of the ancients, he had enriched his memory. On the other hand, Le Brun, his countryman, has been very unhappy this way. Ambitious to have every thing his own, inſtead of allegories, he has filled the gallery of Verſailles with enigmas and riddles, of which none but himſelf was qualified to be the Œdipus. Allegory muſt be ingenious, it is true; but then it muſt be equally perſpicuous; for which reaſon, a painter ſhould avoid all vague and indeterminate alluſions, and likewiſe thoſe to hiſtory and heathen mythology, which are too abſtruſe to be underſtood by the generality of ſpectators. The beſt way, perhaps, to ſymbolize moral and abſtract things, is to repreſent particular events: as Carracci did, by advice of Monſignore Agucchi, in the Farneſian palace. For example, what can better expreſs a hero's love towards his country, than the virtuous Decious conſecrating himſelf boldly to the infernal gods, in order to ſecure victory to his countrymen over their enemies? What finer emblems can we deſire of emulation, and an inſatiable thirſt for glory, than Julius Cæſar weeping before the ſtatue of Alexander in the temple of Hercules at Gades? of the inconſtancy of fortune, than Marius ſitting on the ruins of Carthage, and receiving, inſtead of the acclamations of an army joyfully ſaluting him imperator, orders from a lictor of Sixtilius to quit Africa? of indiſcretion, than Candaules, who, by ſhowing the naked beauties of his wife to his friend Giges, kindled a paſſion that ſoon made him repent his folly? Such repreſentations as theſe require no comment; they carry their explanations along with them. Beſides, ſuppoſing, and it is the worſt we can ſuppoſe, that the painter's aim in them ſhould happen not to be underſtood, his piece would ſtill give delight. It is thus that the fables of Arioſto prove ſo entertaining, even to thoſe who underſtand nothing of the moral couched under them; and likewiſe the Æneis, though all do not comprehend the alluſions and double intent of the poet.

See *Belori's Life of Carracci.*

SECT. X. *Of Diſpoſition.*

So much for invention. *Diſpoſition*, which may be conſidered as a branch of invention, conſiſts in the proper ſtationing of what the inventive faculty has imagined, ſo as to expreſs the ſubject in the moſt lively manner. The chief merit [illegible] diſpoſition may be ſaid to conſiſt in that diſorder, which, wearing the appearance of mere chance, is in fact the moſt ſtudied effect of art. A painter, therefore, is equally to avoid the dryneſs of thoſe ancients who always planted their figures like ſo many couples in a proceſſion, and the affectation of thoſe moderns who jumble them together as if they were met merely to fight and ſquabble. In this branch Raphael was happy enough to chooſe the juſt medium, and attain perfection. The diſpoſition of his figures is always exactly ſuch as the ſubject requires. In the *Battle of Conſtantine*, they are confuſedly cluſtered with as much art, as they are regularly marſhalled in *Chriſt's commitment of the keys to St Peter*, and conſtituting him prince of the apoſtles.

Let the inferior figures of a piece be placed as they will, the principle figure ſhould ſtrike the eye moſt, and ſtand out, as it were, from among the reſt. This may be effected various ways, as by placing it on the foremoſt lines, or in ſome other conſpicuous part of the piece; by exhibiting it, in a manner, by itſelf; by making the principal light fall upon it; by giving it the moſt reſplendant drapery; or, indeed, by ſeveral of theſe methods, nay, by all of them together. For, being the hero of the pictureſque fable, it is but juſt that it ſhould draw the eye to itſelf, and lord it, as it were, over all the other objects.

According to Leon Batiſta Alberti, painters ſhould follow the example of comic writers, who compoſe their fable of as few perſons as poſſible. For, in fact, a crowded picture is apt to give as much pain to the ſpectator, as a crowded road to the traveller.

Some ſubjects, it muſt be granted, require a number, nay, a nation, as it were, of figures. On theſe occaſions, it depends entirely on the ſkill of the painter to diſpoſe of them in ſuch a manner, that the principal ones may always make the principal appearance; and contrive matters ſo that the piece be not overcrowded, or want convenient reſts and pauſes. He muſt, in a word, take care that his piece be full, but not charged. In this reſpect, the *Battles of Alexander* by Le Brun are maſter-pieces which can never be ſufficiently ſtudied; whereas nothing, on the other hand, can be more unhappy than the famous *Paradiſe* of Tintoret, which covers one entire ſide of the great council-chamber at Venice. It appears no better than a confuſed heap of figures, a ſwarm, a cloud, a chaos, which pains and fatigues the eye. What a pity it is that he did not diſpoſe this ſubject after a model of his own, now in the gallery of Bevilacqua at Verona! In this laſt the ſeveral choirs of martyrs, virgins, biſhops, and other ſaints, are judiciouſly thrown into ſo many cluſters, parted here and there by a fine fleece of clouds, ſo as to exhibit the innumerable hoſt of heaven drawn up in a way that makes a moſt agreeable and glorious appearance There goes a ſtory, to our purpoſe, of a celebrated maſter, who in a drawing of the Univerſal Deluge, the better to expreſs the immenſity of the waters that covered the earth, left a corner of his paper without figures. Being aſked, if he did not intend to fill it up; No, ſaid he; do not you ſee that my leaving it empty is what preciſely conſtitutes the picture?

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* *Plinii Nat. Hiſt.* lib. xvii. cap. 5.

The reaſon for breaking a compoſition into ſeveral groups is, that the eye, [illegible] freely from one object to another, may the better comprehend the whole. But the painter is not to ſtop here; for theſe groups are, beſides, to be ſo artfully put together, as to form rich cluſters, give the whole compoſition a ſingular air of grandeur, and afford the ſpectator an opportunity of diſcerning the piece at a diſtance, and taking the whole in, as it were, at a ſingle glance. Theſe effects are greatly promoted by a due regard to the nature of colours, ſo as not to place together thoſe which are apt to pain by their oppoſition, or diſtract by their variety. They ſhould be ſo judiciouſly diſpoſed as to temper and qualify each other.

A proper uſe of the chiaro-ſcuro is likewiſe of great ſervice on this occaſion. The groups are eaſily parted, and the whole picture acquires a grand effect, by introducing ſome ſtrong falls of ſhade, and, above all, one principal beam of light. This method has been followed with great ſucceſs by Rembrandt in a famous picture of his, repreſenting the Virgin at the foot of the croſs on mount Calvary; the principal light darting upon her through a break of the clouds, while the reſt of the figures about her ſtand more or leſs in the ſhade. Tintoret, too, acquired great reputation, as well by that briſkneſs with which he enlivened his figures, as by his maſterly manner of ſhading them; and Polidoro de Caravaggio, though he ſcarce painted any thing but baſſo-relievos, was particularly famous for introducing with great ſkill the effects of the chiaro-ſcuro, a thing firſt attempted by Mantegna in his *Triumph of Julius Cæſar*. It is by this means that his compoſitions appear ſo ſtrikingly divided into different groups, and, among their other perfections, afford ſo much delight through the beautiful diſpoſition that reigns in them.

In like manner, a painter, by the help of perſpective, eſpecially that called *aerial*, the oppoſition of local colours, and other contrivances which he may expect to hit upon by ſtudying nature, and thoſe who have beſt ſtudied her before him, will be able not only to part his groups, but make them appear at different diſtances, ſo as to leave ſufficient paſſages between them.

But the greateſt caution is to be uſed in the purſuit of the methods here laid down; eſpecially in the management of the chiaro-ſcuro, that the effects attributed to light and ſhade, and to their various concomitants, may not run counter to truth and experience. This is a capital point. For this purpoſe, a painter would do well to make, in little figures, as Tintoret and Pouſſin uſed to do, a model of the ſubject that he intends to repreſent, and then illuminate it by lamp or candle-light. By this means he may come to know with certainty, if the chiaro-ſcuro, which he has formed in his mind, does not claſh with the reaſon of things. By varying the height and direction of his light, he may eaſily diſcover ſuch accidental effects as are moſt likely to recommend his performance, and ſo eſtabliſh a proper ſyſtem for the illuminating it. Nor will he afterwards find it a difficult matter to modify the quality of his ſhades, by ſoftening or ſtrengthening them, according to the ſituation of his ſcene, and the quality of the light falling upon it. If it ſhould happen to be a candle or lamp-light ſcene, he would then have nothing to do but conſider his model well, and faithfully copy it.

In the next place, to turn a group elegantly, the beſt pattern is that of a bunch of grapes adopted by Titian. As, of the many grains that compoſe a bunch of grapes, ſome are ſtruck directly by the light, and thoſe oppoſite to them are in the ſhade, whilſt the intermediate ones partake of both light and ſhade in a greater or leſs degree; ſo, according to Titian, the figures of a group ſhould be ſo diſpoſed, that, by the union of the chiaro-ſcuro, ſeveral things may appear as it were but one thing. And in fact it is only from his having purſued this method, that we can account for the very grand effect of his pieces this way, in which it is impoſſible to ſtudy him too much.

The manneriſts, who do not follow nature in the track of the maſters juſt mentioned, are apt to commit many faults. The reaſon of their figures caſting their ſhades in this or that manner ſeldom appears in the picture, or at leaſt does not appear ſufficiently probable. They are, beſides, wont to treſpaſs all bounds in ſplaſhing their pieces with light, that is, in enlivening thoſe parts which we uſually term the deafs of a picture. This method, no doubt, has ſometimes a very fine effect; but it is, however, to be uſed with no ſmall diſcretion, as otherwiſe the whole loſes that union, that pauſe, that majeſtic ſilence, as Carracci uſed to call it, which affords ſo much pleaſure. The eye is not leſs hurt by many lights ſcattered here and there over a picture, than the ear is by the confuſed noiſe of different perſons ſpeaking all together in an aſſembly.

Hogarth's Analyſis of Beauty.

Guido Reni, who has imparted to his paintings that gaiety and ſplendor in which he lived, ſeems enamoured with a bright and open light; whereas Michael Angelo de Caravagio, who was of a ſullen and ſavage diſpoſition, appears fondeſt of a gloomy and clouded ſky: ſo that neither of them were qualified to handle indifferently all objects. The chiaro-ſcuro may likewiſe prove of great ſervice to a painter in giving his compoſition a grand effect; but, nevertheleſs, the light he chooſes muſt be adapted to the ſituation of the ſcene where the action is laid: nor would he be leſs faulty, who in a grotto or cavern, where the light entered by a chink, ſhould make his ſhades ſoft and tender, than he who ſhould repreſent them ſtrong and bold in an open ſky-light.

But this is by no means the only fault which manneriſts are apt to be guilty of in hiſtorical pieces, and particularly in the diſpoſition of their figures. To ſay nothing of their favourite group of a woman lying on the ground with one child at her breaſt, and another playing about her, and the like, which they generally place on the firſt lines of their pieces; nor of thoſe half-figures in the back ground peeping out from the hollows contrived for them: they make a common practice of mixing naked with clothed figures; old men with young; placing one figure with its face towards you, and another with its back; they contraſt violent motions with languid attitudes, and ſeem to aim at oppoſition in every thing; whereas oppoſitions never pleaſe, but when they ariſe naturally from the ſubject, like antitheſes in a diſcourſe.

As to foreſhortened figures, too much affectation in uſing or avoiding them is equally blameable. The attitudes had better be compoſed than otherwiſe. It very ſeldom happens that there is any occaſion for making them ſo impetuous as to be in danger of loſing their equilibrium; a thing too much practiſed by ſome painters.

In regard to drapery, equal care ſhould be taken to avoid that poverty, which makes ſome maſters look as if, through mere penury, they grudged clothes to their figures; and that profuſion which Albani imputed to Guido, ſaying, that he was rather a tailor than a painter. The ornaments of dreſs ſhould be uſed with great ſobriety; and it will not be amiſs to remember what was once ſaid to an ancient painter: "I pity you greatly; unable to make Helen handſome, you have taken care to make her fine."

Let the whole, in a word, and all the different parts of the diſpoſition, poſſeſs probability, grace, coſtume, and the particular character of what is to be repreſented. Let nothing look like uniformity of manner; which does not appear leſs in the compoſition than it does in colouring, drapery, and deſign; and is, as it were, that kind of accent, by which painters may be as readily diſtinguiſhed as foreigners are, by pronouncing in the ſame manner all the different languages they happen to be acquainted with.

SECT. XI. *Of Illuſion.*

AMONG painters, and the writers on painting, there is one maxim univerſally admitted and continually inculcated; it is, that *nature ought to be imitated*, and objects are ſaid to be repreſented naturally, when they have ſuch relief that they may ſeem real. If we inquire to what degree painting may carry this illuſion, we ſhall find that it deceives the eye, and obliges the ſpectator to employ the touch in mouldings and in baſſo-relievos where they are a little projected; but that it is weakened and the effect partly deſtroyed where the projection is one or two feet. It is poſſible alſo to make it in the higheſt degree complete in pictures of flowers, fruits, and other repreſentations of ſtill life, provided they be ſeen in a certain point of view, and at a conſiderable diſtance; but there is no example of a picture containing a number of figures, and placed in a proper light, being miſtaken for real life. We are told, indeed, of a buſt of an abbé painted by Charles Coypel, which, placed in a certain direction behind a table, and in a certain light, deceived ſeveral perſons ſo completely as to induce them to ſalute it: but, without admitting any thing very extraordinary in the projection or illuſion of this painting, it is evident, from the circumſtances attending the relation, that the deception aroſe from ſurpriſe and inattention, which might happen to a production of an inferior artiſt. And hence we may conclude that it is vain to pretend to perfect the illuſion, eſpecially in pictures conſiſting of a number of figures, and with conſiderable diſtances ſuppoſed between them.

Among the obſtacles which are oppoſed to the perfection of this branch of the art, we ſhall chiefly attend to thoſe which naturally proceed from our habits of thinking and judging on all occaſions. Theſe, together with the experience we daily have of light on all kinds of ſurfaces, and of all colours, are ſufficient to demonſtrate the want of reality in the mere repreſentation of any ſcenes.

It has been elſewhere ſhewn, that diſtance, figure, and magnitude, are not naturally objects of perception by the ſenſe of ſight; that we judge of theſe things by the eye only, in conſequence of aſſociations early formed between the perceptions of touch and the correſponding impreſſions on the retina and optic nerve by the rays of light; and that a painter makes his picture reſemble the original, merely by laying his colours on a plain ſurface in ſuch a manner, as that they reflect the ſame rays of light with the convex or concave original, when the ſpectator ſtands at the proper diſtance (ſee METAPHYSICS, n° 49, 50, 51, 52, and 95). But if this be admitted, illuſion in painting can never be made perfect, on account of the inevitable falſity of the ſhades which mark the moſt diſtant parts of the picture. The painter can only imitate thoſe ſhades by obſcure colours, laid on a plane ſurface, and ſuſceptible of reflecting the light with a degree of force relative to the real diſtance. Now our eyes give us the true plane of this ſurface, oppoſed to the idea of deepening which the painter wiſhes to produce, a contrariety which prevents the deception. On this account, the faults found in the works of the greateſt maſters, with regard to the effects produced by the whole, moſt frequently relate to their manner of ſhading, which is ſufficient to prove, that the want of illuſion in painting depends chiefly on the imperfection of the ſhades.

This defect, though it cannot be wholly avoided, may yet be rendered leſs perceptible. There has yet, indeed, been no painter able to imitate ſhadow, nor is it probable that any one will ever perfectly accompliſh his taſk. Shadow in nature is not a body, but the privation of light, which deſtroys colours in a greater or leſs degree, in proportion as it is more or leſs complete. Now the painter can only imitate this privation and real darkneſs, by colours which muſt from their very nature be capable of reflecting light.—The colours may be more or leſs obſcure, but they preſerve always ſomething which gives a mixture of reflection. To carry the imitation of ſhadow to the higheſt degree of perfection, it would be neceſſary to apply a colour capable of darkening all others, more or leſs as there ſhould be occaſion, and which might have no viſible trace of its exiſtence, that is, no one part of it which reflected one coloured ray more ſtrongly than another. Perhaps this kind of negative colour might be found in practice to be of ſervice to the art; but it would not render the ſurface totally inviſible, for it would be neceſſary, farther, that it ſhould have the property of not reflecting a ſingle ray of light when expoſed to it; which is altogether impoſſible, as there is no colour or body in nature without reflection in ſuch a ſituation.

We ſhall be further convinced of the impoſſibility of painting ſhadow, if we attend to the pictures of the greateſt maſters, with regard to the imitation of truth. Every part, when taken by itſelf, connected with light, or with demitints, preſents a perfect imitation. Even the different degrees of light or the objects are ſufficiently exact; but notwithſtanding this aſſemblage of circumſtances correſponding with truth, and of which the reſult ſhould be perfect *illuſion*, yet in conſidering the whole, we are never ſo completely deceived, as to take a picture for a reality; from which we may conclude, that the want of illuſion proceeds almoſt entirely from the imperfection of ſhading.

Illuſion then, in the ſtricteſt ſenſe, cannot exiſt in painting; but there is another kind of illuſion, perhaps improperly ſo called, which is one of the principal parts of the art, and worthy of the greateſt attention. It is, that the picture ſhall reſemble truth to ſuch a degree by the juſtneſs of its forms, by the combination of colours, and by all its general effects, that the image ſhall give all the pleaſure to be expected from the imitation of truth. This is not illuſion in the proper ſenſe of the word, ſince it exiſts as well in pictures on a ſmall ſcale as in thoſe of equal dimenſions with the original; but it is that true imitation of [illegible] painting is ſuſceptible, even [illegible] pictures containing any number of figures at any reaſonable diſtance from each other.

But it remains to be conſidered whether the imitation of truth, taken by itſelf, be the higheſt [illegible] perfection in painting. It is generally granted, [illegible] the greateſt beauty is that which not only pleaſes [illegible] firſt view, but on the neareſt and moſt critical examination. But if illuſion, ſuch as we have defined it, were the ſole merit of the [illegible] would follow, that the perſon who was leaſt acquainted with its beauties would experience the ſame pleaſure [illegible] he who had ſtudied them moſt. Farther, in examining the works of the greateſt maſters, it is eaſy to perceive, that it is not their illuſion which has excited the attention and admiration of the critic. Even the works of the divine Raphael do not deceive the eye in any point of view more completely than thoſe of an ordinary painter. Raphael, pure in his character and deſign, is, without doubt, very deficient in that part of the art. Meanwhile the grandeur of his ideas, [illegible], and the choice of his forms; the beauty of his heads, wherein one does not admire ſimply the imitation of any known truth; his ingenious and noble manner in drapery, which yet does not reſemble any known ſtuff, or the garb of any nation; in ſhort, all his beauties are ſuperior to the ſimple imitation of truth, and contradict the ſentiment of the greateſt pleaſure ariſing from illuſion.

If we paſs to thoſe who have purſued colouring with the greateſt ſucceſs, we ſhall find them, doubtleſs, approach nearer to illuſion than thoſe who have neglected it; and it is alſo a fact, that their works have been more univerſally admired.

At the ſame time it is not the illuſion occaſioned by colours which has altogether excited this admiration. The exquiſite demitints and the freſhneſs of Corregio and Titian, which excel the ordinary beauties of nature, and even imitate her moſt perfect productions, may perhaps not be conſidered as deſtroying illuſion; but it is no leſs a fact, that weaker and leſs precious colouring would carry it to greater perfection. Beſides, this large, eaſy, and exquiſite, manner of painting, this harmony, of which they have given us the beſt examples, are owing to qualities in them much more excellent than what would be ſufficient to produce the ſimple imitation of truth. Guido, Cortona, and ſome others, appear to approach nearer to illuſion. But even thoſe maſters prove by their works, that the moſt eſtimable beauties in painting do not all tend to this branch of the art; for notwithſtanding the high character which they have gained, they are much inferior to Raphael, Corregio, and Titian, although the firſt failed in colouring and in the knowledge of the claro-obſcuro, the ſecond in point of correctneſs, and the third in the choice of noble ſubjects.

From this we may conclude, that the neareſt reſemblance to truth is not the ſole object in painting; that it requires a ſuperior degree of elevation by the art of adding beauty and perfection to the moſt exact reſemblance; and that it is this art which diſtinguiſhes and characterizes extraordinary men.

If we run over the great [illegible] of painting, we ſhall find a number of eſſential beauties different from thoſe which are capable of carrying illuſion to the greateſt poſſible height. In compoſition, we principally admire the [illegible] of genius, the choice of [illegible] and graceful attitudes, the ingenious com[illegible] groups, whether in uniting the light and [illegible] to obtain the greateſt effect, or in dis[illegible] in ſuch a manner as to make no part [illegible]; and finally, that kind of practical talent by which the mind takes poſſeſſion of nature, and forces it to produce all the beauties of which the art is ſuſceptible. In this enumeration of particulars it is eaſy to perceive that the beauties of compoſition are very diſtant from thoſe of illuſion.

To obtain illuſion in deſign, there is no occaſion for [illegible]neſs nor taſte beyond what is perceived in [illegible] by the moſt ignorant ſpectator. And with regard to colouring, that is not always moſt admired which is moſt natural. What departs widely from truth, is not of conſequence beautiful, but many qualities are required beſides the ſimple imitation of truth. Freſhneſs, eaſe, and tranſparency in certain tones, are deemed abſolutely requiſite; and the moſt eſteemed colouriſts have carried their beauties in all theſe reſpects beyond what they have ſeen in nature. If ſome tones in the fleſhy parts have approached towards vermilion, to a light-blue, or a ſilver-grey, they have made them more apparent; not only to point them out to the ſpectator, but to ſhow their knowledge in the diſcovery and their art in painting them. This would have been going beyond the limits of perfection, if theſe had conſiſted in ſimple illuſion.

The oppoſition of colour, of light, and of ſhade, would have been in this caſe alſo ſuperfluous; for nature is always true, without any pointed attempt to make her more engaging. The ſuppreſſion of certain lights, which truth would require, and which art extinguiſhes, in order to augment the harmony of effect, would be alſo worthy of cenſure, whatever pleaſure would reſult from it.

Illuſion.

Finally, one of the greateſt beauties of the art, namely the peculiar manner of a great maſter, has no relation to illuſion. This is not even founded in nature, but depends on the genius or ſingularity of the artiſt. It is this manner which diſtinguiſhes the original of a great maſter from the moſt exact copy; and which characterizes the talents of the artiſts ſo well, that the ſmalleſt part of the picture, and even the leaſt intereſting, is ſufficient to diſcover the painter. The diſtinction between the beautiful and illuſive in painting has made Sir Joſhua Reynolds, in expreſs terms, recommend a perfection ſuperior to the imitation of nature. "The principle now laid down (ſays he), that the perfection of the art does not conſiſt in mere imitation, is far from being new or ſingular. It is, indeed, ſupported by the general opinion of the enlightened part of mankind. The poets, orators, and rhetoricians of antiquity, are continually enforcing this poſition, that all the arts receive their perfection from an ideal beauty, ſuperior to what is to be found in individual nature. They are ever referring to the practice of the painters and ſculptors of their times, particularly Phidias the favourite artiſt of antiquity, to illuſtrate their aſſertions. As if they could not ſufficiently expreſs their admiration of his genius by what they knew, they have recourſe to poetical enthuſiaſm. They call it inſpiration; a gift from heaven. The artiſt is ſuppoſed to have aſcended the celeſtial regions to furniſh his mind with [illegible] idea of beauty. 'He (ſays Proclus) [illegible] his model ſuch forms as nature produces, [illegible] himſelf to an exact imitation of them, [illegible] tain to what is perfectly beautiful. For the works of nature are full of diſproportion, and fall ſhort of the true ſtandard of beauty. So that Phidias, when he formed his Jupiter, did not copy any object ever preſented to his ſight; but contemplated only that image which he had conceived in his mind from Homer's deſcription.'

"It is not eaſy to define in what this [illegible] conſiſts, nor to deſcribe by words the prope[illegible] acquiring it, if the mind of the ſtudent [illegible] capable of ſuch an acquiſition. Could we teach [illegible] or genius by rules, they would be [illegible] genius. But though there neither are nor can be any preciſe invariable rules for the exerciſe or the acquiſition of theſe great qualities, yet we may truly ſay that they always operate in proportion to our attention in obſerving the works of nature, to our ſkill in ſelecting, and to our care in digeſting, methodiſing, and comparing our obſervations. There are many beauties in our art that ſeem at firſt to lie without the reach of precept, and yet may eaſily be reduced to practical principles. Experience is all in all; but it is not every one that profits by experience; and moſt people err not ſo much from want of capacity to find their object, as from not knowing what object to purſue. This great ideal perfection and beauty are not to be ſought in the heavens, but upon the earth. They are about us, and upon every ſide of us: But the power of diſcovering what is deformed in nature, or, in other words, what is particular or uncommon, can be acquired only by experience; and the whole beauty and grandeur of the art conſiſts in being able to get above all ſingular forms, local cuſtoms, particularities, and details of every kind."

After theſe opinions, however, derived from the practice of the art, and this high authority, it may not be improper to hazard a few obſervations. Although illuſion can be diſtinguiſhed from many of the moſt excellent parts of the art taken ſeparately, yet it does not follow that it ſhall not add in every picture to the beauty of the whole. It is impoſſible to ſtate it in oppoſition to deſign, to compoſition, to colouring, or to the peculiar manner of a great artiſt; becauſe all theſe may exiſt where there alſo exiſts the moſt perfect illuſion. This is evident from the works of art which have real relievo, and which at the ſame time are capable of perfection in all thoſe branches, and of ſhowing the peculiar manner of the artiſt. Again, it appears evident, that *illuſion*, properly ſo called, ſhould be a proper object of attention in painting. We may rate the ideal beauty very high, and with great juſtice; but it ſtill conſiſts in overcoming the defects in individual objects in nature, and not in departing from the truth of repreſentation. And perhaps it may be alleged, that the impoſſibility of giving perfect illuſion on a plain ſurface has puſhed the greateſt maſters [illegible] far, and [illegible] them crowd artificial beauties [illegible] pictures to conceal their want of power to [illegible]. It is not improbable that on this very account [illegible] art is leſs perfect than otherwiſe it might have [illegible]. Even in all ſubjects thought to be impoſſible [illegible] is not only great room for exertion, but [illegible] carries the art to greater perfection as he [illegible] nearer to ſhow that it may not be impoſſible. [illegible] if the works of Raphael, in point of illuſion, are not ſuperior to an [illegible], we may be permitted to ſay that [illegible] room for improvement in this branch.

[illegible] *Of the Coſtume.*

The coſtume in painting correſponds with the unities of time, place, and action, in tragedy and in epic poetry. It is chiefly confined to hiſtory painting; and regards the cuſtoms of different periods, the manners, the [illegible], and the colour, of different nations. [illegible] in the coſtume is ſcarcely practicable; but [illegible] departure from it denotes unpardonable negligence. It frequently happens that a piece compoſed of pictureſque figures derives conſiderable advantage from certain liberties which are calculated to pleaſe both the artiſt and the ſpectator; for the judges of painting are not habitually occupied with the details of ancient and modern hiſtory, or profoundly verſed in all the circumſtances which make a departure from the coſtume conſpicuous. On the other hand, if they were ſo ignorant as not to underſtand, or ſo indifferent as not to regard thoſe circumſtances, this branch of the art would be altogether arbitrary. The road of the painter is between theſe two extremes, not to deſpiſe beauty on the one hand, nor probability on the other. But in purſuing this part of the art, it is in vain to ſeek for perfect models in ancient or modern painting.

Mancheſter Tranſactions, vol. iii. p. 564.

"When Raphael in his cartoons introduces monks and Swiſs guards; when he puts into a boat more figures, &c.

gures than it is evident the boat could actually contain; when in the chaſtiſement of Heliodorus, who attempted to deſpoil the temple of Jeruſalem, Pope Julius II. is depicted as being preſent; when, in the donation of Conſtantine in the Vatican, a naked boy is placed conſpicuous in the fore ground, aſtride upon a dog in the immediate preſence of the pope and the emperor; when Venetian ſenators are introduced while Pope Alexander excommunicates Barbaroſſa; when Ariſtotle, Plato, Dante, and Petrarch, are brought together in the ſchool of Athens, to omit the leſſer improprieties of ſhoeleſs apoſtles, &c.—every perſon muſt acknowledge that ſuch offences as theſe againſt truths ſo obvious, if they do not ariſe from a defect of underſtanding, are inſtances of inexcuſable careleſsneſs.

"In like manner, when the ſame great maſter paints the dreams of Joſeph and his fellow-priſoner in circles over their heads; when ſimilar contrivances to expreſs future events are uſed by Albani, Pameggiano, and Fuſeli—is it not evident that no poſſibility can make the fiction true; and that real and feigned exiſtences are unnaturally introduced in one narration?

"When Polydore chooſes to repreſent the death of Cato, and expoſes to the ſpectator the hero of the piece with his bowels guſhing out; when Paul Veroneſe, at a banquet painted with his uſual magnificence, places before us a dog gnawing a bone, and a boy making water: however ſuch diſguſting circumſtances may be forgiven in the *chef d'œuvre* of a Michael Angelo, had he repreſented theſe inſtead of the horrible figures of his day of Judgment, the performance of an inferior artiſt cannot atone for them.

"So alſo, when one of the firſt rate among the modern painters, we mean Paul Veroneſe, introduces Benedictine monks at the marriage of Cana; when, in a picture of the crucifixion, he puts the Roman ſoldiers in the jerkins of the 16th century, and adorns their heads with turbans; when Guido, in a painting of Jeſus appearing to his mother after his reſurrection, places St Charles Borromèe in a kind of deſk in the back-ground as witneſs to the interview; when Tintoret, at the miraculous fall of manna, arms the Iſraelites with fuſils; and Corregio appoints St Jerome as the inſtructor of the child Jeſus—common ſenſe revolts at the impropriety; and we are compelled to exclaim, *Quicquid oſtendis mihi ſic, incredulus odi!*

"The mythological taſte of the learned Pouſſin is well known; but Rubens ſeems to claim the merit of having preſented to the world a ſtill greater number of ſupreme abſurdities in this learned ſtyle: nor is it eaſy to conceive a more heterogeneous mixture of circumſtances, real and imaginary, ſacred and profane, than the Luxembourg gallery, and the other works of that great maſter, perpetually exhibit.

"When ſo great an authority as Sir Joſhua Reynolds* contends for the rejection of common ſenſe in favour of ſomewhat he terms a *higher ſenſe*; when he laments, indirectly, that art is not in ſuch high eſtimation with us, as to induce the generals, lawgivers, and kings of modern times, to ſuffer themſelves to be repreſented naked, as in the days of ancient Greece; when he defends even the ridiculous aberrations from poſſibility, which the extravagant pencil of Rubens has ſo plentifully produced—it is not ſurpriſing that the artiſts of the preſent day ſhould be led to reject the company of common ſenſe; or that Sir Joſhua's performances ſhould furniſh examples of his own precepts.

"Mrs Siddons is repreſented by Sir Joſhua in the character (as it is ſaid) of the tragic muſe: She is placed in an old-faſhioned arm chair; this arm chair is ſupported by clouds, ſuſpended in the air; on each ſide of her head is a figure not unapt to ſuggeſt the idea of the attendant imps of an enchantreſs: of theſe figures, one is ſuppoſed to repreſent Comedy, and the other Tragedy; Mrs Siddons herſelf is decently attired in the faſhionable habilements of 20 or 30 years ago.

"If this be a picture of the tragic muſe, ſhe ought not to appear in a modern dreſs, nor ought ſhe to be ſeated in an old arm chair. If this be a portraiture of Mrs Siddons, ſhe has no buſineſs in the clouds, nor has ſhe any thing to do with aerial attendants. If this be Mrs Siddons in the character of the tragic muſe, the firſt ſet of objections apply; for ſhe is placed in a ſituation where Mrs Siddons could never be.

"In the death of Dido, Sir Joſhua Reynolds introduces her ſiſter, lamenting over the corpſe of the unfortunate queen. This is poſſible; but he has alſo introduced Atropos cutting Dido's hair with a pair of ſciſſars, a being equally real and apparent in the painting with Dido or her ſiſter. This (continues our author) appears to me a groſs offence againſt mythological probability; nor is it the only offence againſt the coſtume with which that picture is chargeable.

"There is one other breach of the coſtume, however common among painters, more groſs and offenſive than any of the inſtances hitherto alleged; we mean the perpetual and unneceſſary diſplay of the naked figure. We ſhall not ſtay to enquire whether more ſkill can be ſhown in painting the human body clothed or unclothed. If the perſonages introduced in any picture are more naked in the repreſentation than can be juſtified by the probability of the times, perſons, places, or circumſtances, it is a breach of the coſtume proportionate to the deviation. *This* fault, however, is ſo common as hardly to be noticed; ſo ſlight indeed, when compared with that general taſte for voluptuous imagery and obſcene repreſentation, which has ſo long diſgraced the art of painting in every ſtage of its progreſs, that ſcience and morality are callous to the *ſlight* offence.

"This depravity of imagination, this proſtitution of the pencil to the baſe purpoſes of laſcivious inclination, was a ſubject of much complaint among the ancients. Nor is there leſs reaſon to complain in modern times, that this delightful art, which might be employed in exciting the nobleſt ſentiments, and become ſubſervient to the beſt intereſts of ſociety, ſhould ſo often be exerciſed upon ſubjects ſolely calculated to pleaſe the eye of the voluptuary and debauchee. It is hardly poſſible to paſs through any admired collection without meeting with ſome of theſe; of which, however excellent the performance may be, the common feelings of decency and morality (if we are neither profeſſed artiſts nor connoiſſeurs) prevent us from viewing them without a mixture of diſguſt."

*Et pudor averſos texit velamine vultus**.

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* *Diſcourſes*, 8vo, p. 286.

* Abbé de Marſy.

Coſtume

It is impoſſible to expreſs how much a picture ſuffers by ſuch looſeneſs of fancy, and ſinks as a baſtard of the art in the eſteem of good judges. Some people, indeed, are of opinion, that ſo ſcrupulous an obſervance of the coſtume is apt to hurt pictures, by depriving them of a certain air of truth ariſing, they think, from thoſe features and habits to which we are accuſtomed; and which are therefore apt to make a greater impreſſion, than can be expected from things drawn from the remote ſources of antiquity; adding withal, that a certain degree of licence has ever been allowed thoſe artiſts who in their works muſt make fancy their chief guide. See, ſay they, the Greeks; that is, the maſters of Raphael and Pouſſin themſelves. Do they ever trouble their heads about ſuch niceties? The Rhodian ſtatuaries, for example, have not ſcrupled to repreſent Laocoon naked; that is, the prieſt of Apollo naked in the very act of ſacrificing to the gods, and that too in preſence of a whole people, of the virgins and matrons of Ilium. Now, continue they, if it was allowable in the ancient ſtatuaries to neglect probability and decency to ſuch a degree, to have a better opportunity of diſplaying their ſkill in the anatomy of the human body; why may it not be allowable in modern painters, the better to attain the end of their art, which is deception, to depart now and then a little from the ancient manners and the too rigorous laws of the coſtume? But theſe reaſons, we beg leave to obſerve, are more abſurd than they are ingenious. What! are we to draw concluſions from an example, which, far from deciding the diſpute, gives occaſion to another? The learned are of opinion, that thoſe Rhodian maſters would have done much better had they looked out for a ſubject in which, without offending ſo much againſt truth, and even probability, they might have had an equal opportunity of diſplaying their knowledge of the naked. And certainly no authority or example whatever ſhould tempt us to do any thing contrary to what both decency and the reaſon of things require, unleſs we intend, like Carpioni, to repreſent

Sogni d'infermi, e ſole di romanzi.
The dreams of ſick men, and the tales of fools.

No: a painter, the better to attain the end of his art, which is deception, ought carefully to avoid mixing the antique with the modern, the domeſtic with the foreign; things, in ſhort, repugnant to each other, and therefore incapable of gaining credit. A ſpectator will never be brought to conſider himſelf as actually preſent at the ſcene, the repreſentation of which he has before him, unleſs the circumſtances which enter it perfectly agree among themſelves, and the field of action, if we may uſe the expreſſion, in no ſhape belies the action itſelf. For inſtance, the circumſtances, or, if you pleaſe, the acceſſories, in a *Finding of Moſes*, are not, ſurely, to repreſent the borders of a canal planted with rows of poppies, and covered with country-houſes in the European taſte; but the banks of a great river ſhaded with cluſters of palm-trees, with a Sphinx or an Anubis in the adjacent fields, and here and there in the back-ground a towering pyramid. And indeed the painter, before he takes either canvas or paper in hand, ſhould on the wings of fancy tranſport himſelf to Egypt, to Thebes, or to Rome; and ſummoning to his imagination the phyſiognomy, the dreſs, the plants, the buildings, ſuitable to his ſubject, with the particular ſpot where he has choſen to lay his ſcene, ſo manage his pencil, as, by the magic of it, to make the enraptured ſpectators fancy themſelves there along with him.

Proper Books for a Painter.

Sect. XIII. *Of proper Books for a Painter.*

From what has been already ſaid, it may be eaſily gathered, that a painter ſhould be neither illiterate nor unprovided with books. Many are apt to imagine, that the Iconologia of Ripa, or ſome ſuch collection, is alone ſufficient for this purpoſe; and that all the apparatus he ſtands in need of, may be reduced to a few caſts of the remains of antiquity, or rather to what Rembrandt uſed to call his *antiques*, being nothing more than coats of mail, turbans, ſhreds of ſtuff, and all manner of old houſehold trumpery and wearing apparel. Such things, no doubt, are neceſſary to a painter, and perhaps enough for one who wants only to paint half-lengths, or is willing to confine himſelf to a few low ſubjects. But they are by no means ſufficient for him who would ſoar higher; for a painter who would attempt the Univerſe, and repreſent it in all its parts, ſuch as it would appear, had not matter proved refractory to the intentions of the ſovereign Artiſt. Such a painter alone is a true, an univerſal, a perfect painter.——No mortal, indeed, muſt ever expect to riſe to that ſublimity; yet all ſhould aſpire to it, on the pain of otherwiſe ever continuing at a very mortifying diſtance from it: as the orator, who wiſhes to make a figure in his profeſſion, ſhould propoſe to himſelf no leſs a pattern than that perfect orator deſcribed by Tully; nor the courtier, than that perfect courtier delineated by Caſtiglione. It cannot, therefore, appear ſurpriſing, if we inſiſt on the propriety of reckoning a good collection of books as part of ſuch a painter's implements. The Bible, the Greek and Roman hiſtorians, the works of Homer, that prince of poets, and of Virgil, are the moſt claſſical. To theſe let him add the Metamorphoſes of Ovid, ſome of our beſt poets, the voyage of Pauſanias, Vinci, Vaſari, and others, upon painting.

Algaroti on Painting.

It will alſo be of conſiderable advantage to him to have a well choſen collection of drawings by the beſt maſters (D), in order to trace the progreſs and hiſtory of his art, and make himſelf acquainted with the various ſtyles of painting which have been, and now are, in the greateſt vogue. The prince of the Roman ſchool was not aſhamed to hang up in his ſtudy the drawings of Albert Durer; and ſpared no pains or expence to acquire

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(D) We have formerly (ſee Anatomy, p. 672. column 2.) mentioned a great anatomical work carrying on by Andrew Bell, Eſq; in Edinburgh, of the figures of which, as they are engraved under the inſpection of ſo able an anatomiſt as Mr Fyfe, and with the approbation of Dr Monro, we may at leaſt form a favourable opinion; and if well executed, of which there can be but little doubt, they will unqueſtionably be of eſſential ſervice to the painter.

acquire all the drawings he could meet with that were taken from baſſo relievos; things which the art of engraving has ſince rendered ſo common as to be in every one's hands. This art of multiplying drawings by means of the graver, is of the ſame date, and boaſts the ſame advantages, with the art of printing, by means of which the works of the mind are multiplied, as it were, at one ſtroke, and diſperſed over the whole world.

The ſight of fine ſubjects treated by able maſters, and the different forms which the ſame ſubjects aſſume in different hands, cannot fail both of enlightening and enflaming the mind of the young painter. The ſame may be ſaid of the peruſal of good poets and hiſtorians, with the particulars and proofs of what they advance; not to mention thoſe ideas and flights of invention, with which the former are wont to clothe, beautify, and exalt every thing they take in hand. Bouchardon, after reading Homer, conceived, to uſe his own words, that men were three times taller than before, and that the world was enlarged in every reſpect. It is very probable, that the beautiful thought of covering Agamemnon's face with the ſkirt of his mantle at the ſacrifice of Iphigenia, was ſuggeſted to Timantes by the tragedy of Euripides. And the ſublime conceit of Raphael, who, in a *Creation* of his, repreſents God in the immenſe ſpace, with one hand reaching to the ſun and the other to the moon, may be conſidered as the child of the following words of the Pſalmiſt: *The heavens declare the glory of God, and the firmament ſheweth his handy-work.*

This thought of Raphael has been, indeed, cenſured by Mr Webb. "A God (ſays this gentleman), extending one hand to the ſun, and another to the moon, deſtroys that idea of immenſity which ſhould accompany the work of creation, by reducing it to a world of a few inches." But the opinion of Count Algarotti is very different. "For my part, (ſays that elegant critic), I cannot diſcover in this painting a world of a few inches, but a world on a much greater ſcale; a world of millions and millions of miles: and yet this ſo immenſe a world, by means of that act of the Godhead, in which with one hand he reaches to the ſun, and with the other to the moon, ſhrinks, in my imagination, to a mere nothing, in reſpect to the immenſity of God himſelf; which is all that the powers of painting can pretend to. This invention is, though in a contrary ſenſe, of the ſame kind with that of Timantes, who, to expreſs the enormous ſize of a ſleeping Polyphemus, placed round him ſome ſatires meaſuring the monſter's thumb with a thyrſus. Hence Pliny, who relates the fact, takes occaſion to tell us, that his works always imply more than they expreſs; and that how great ſo ever he may be in execution, he is ſtill greater in invention: *Atque in omnibus ejus operibus intelligitur plus ſemper quam pingitur; et cum ars ſumma ſit, ingenium tamen ultra artem eſt.*" Nat. Hiſt. lib. xxxv. c. 10.

The peruſal of good authors cannot but be very ſerviceable to a painter in another reſpect; as, among the great number of ſubjects afforded by hiſtory and poetry, he may expect to meet with many on which his talents may diſplay themſelves to the greateſt advantage. A painter can never be too nice in the choice of his arguments; for on the beauty of them, that of his piece will greatly depend. How much to be pitied, therefore, were our firſt maſters, in being ſo often obliged to receive their ſubjects from the hands of ſimple and illiterate perſons! and what is worſe, to ſpend all the riches of their art upon barren or unworthy ſubjects! Such are the repreſentations of thoſe ſaints, who, though they never had the leaſt intercourſe with each other, and perhaps even lived in different ages, are, notwithſtanding, to be introduced, *tete à tete*, as it were, in the ſame picture. The mechanic of the art may, indeed, diſplay itſelf on theſe occaſions; but by no means the ideal. The diſpoſition may be good and praiſe-worthy, as in the works of Cortoni and Lanfranc: but we are not to expect in them either invention or expreſſion, which require for their baſis the repreſentation of ſome fact capable of producing ſuch effects. Who does not, on the bare mention of this abuſe, immediately recollect many ſad inſtances of it? ſuch as the famous St Cecilia of Raphael, ſurrounded by St Paul, St Mary Magdalen, St John, and St Auguſtin; and the picture of Paolo Veroneſe, in the veſtry of the Nuns of St Zachary at Venice, in which St Francis of Aſſiſium, St Catharine, and St Jerome richly habited in his cardinal's robes, form a ring round the Virgin ſeated on a throne with the child Jeſus in her arms; perhaps the moſt beautiful and pictureſque of all the inſipid and inſignificant pieces with which Italy abounds. It is very ſhocking to think, that young painters ſhould be obliged to ſtudy their art from ſuch wretched compoſitions.

The ſubjects in which the pencil triumphs moſt, and with which a judicious painter may ſtock himſelf by the peruſal of good books, are, no doubt, thoſe which are moſt unverſally known, which afford the largeſt field for a diſplay of the paſſions, and contain the greateſt variety of incidents, all concurring, in the ſame point of time, to form one principal action. Of this the ſtory of Coriolanus beſieging Rome, as related by Livy, is a ſhining example. Nothing can be imagined more beautiful than the ſcene of action itſelf, which ought to take in the prætorium in the camp of the Volſcians, the Tiber behind it, and the ſeven hills, among which the towering Capitol is, as it were, to lord it over the reſt. It is impoſſible to conceive a greater variety, than what muſt appear in that crowd of ſoldiers, women, and children, all which are to enter the compoſition; unleſs, perhaps, it be that of the different paſſions with which they are ſeverally agitated; ſome wiſhing that Coriolanus may raiſe the ſiege, others fearing it, others again ſuſpecting it. But the principal groupe forms the pictureſque part of the piece. Coriolanus, haſtily deſcending from his tribunal, and hurried on by filial affection, to embrace his mother, ſtops ſhort through ſhame, on her crying out to him, Hold! let me firſt know, if it is a ſon, or an enemy, I am going to embrace? Thus a painter may impart novelty to the moſt hacknyed ſubject, by taking for his guides thoſe authors who poſſeſs the happy talent of adding grace and dignity, by their beautiful and ſublime deſcriptions, even to the moſt common and trifling tranſactions.

Livy, Dec. II. lib. 2.

SECT.

Sect. XIV. *Of the Painter's Balance.*

The celebrated De Piles, who by his writings has thrown ſo much light upon painting, in order to aſſiſt young painters in forming a right judgment of thoſe maſters who hold the firſt rank in the profeſſion, and to reduce ſuch judgment to the greater preciſion, bethought himſelf of a pictorical balance, by means of which a painter's merit may be weighed with the greateſt exactneſs. This merit he divides into Compoſition, Deſign, Colouring, and Expreſſion; and in each of theſe branches he has aſſigned to every painter that ſhare to which he thought him intitled, according as he approached more or leſs the higheſt degree of excellence and ſummit of perfection; ſo that, by ſumming up the numbers which, ſtanding againſt each maſter's name, expreſs his ſhare of merit in each of theſe branches, we have his total merit or value in the art, and may hence gather what rank one painter holds in regard to another. Several objections, it is true, have been ſtarted to this method of calculation, by a famous mathematician of our days, who, among other things, inſiſts, that it is the product of the above numbers multiplied by each other, and not the ſum of them, that gives the merit of the artiſt. But this is not a place to enter into ſuch niceties, nor indeed would the doing of it be of any ſervice to the art. The only thing worth our notice is, whether the original numbers, ſtanding for the painter's merit in the ſeveral branches of his art, are ſuch as he is really intitled to, without ſuffering ourſelves to be biaſſed by any partiality, as De Piles has been, in favour of the prince of the Flemiſh ſchool; the conſequence of which, ſtrange as it may appear, is, that in his balance Raphael and Rubens exactly turn out of the ſame weight.

See Mairan' remarks, in *Mem. de l'Acad. des Sciences.* 1753.

The idea of the painter's balance is doubtleſs curious, and therefore deſerved to be mentioned; but as the merits of the moſt eminent painters have been already appretiated under the ſecond ſection of the hiſtorical part of our article, to which we refer, it is needleſs to be more particular here, or to repeat what has been already treated of at ſufficient length.

Sect. XV. *Practical Obſervations.*

Having thus laid down the principles of the art, and ventured to give the ſtudent ſome directions with regard to his ſtudies, we ſhall conclude this part of the ſubject with a few obſervations relative wholly to practice.

And, 1. The young painter muſt be careful not to be led aſtray by the ambition of compoſing eaſily, or attaining what is called a *maſterly handling* of the chalk or the pencil; a pernicious attempt, by which ſtudents are excluded from all power of advancing in real excellence. To this attempt, however, young men have not only the frivolous ambition of being thought maſterly, inciting them on the one hand, but alſo their natural ſloth tempting them on the other. They are terrified at the proſpect before them, and of the toil required to obtain exactneſs; whilſt the lives of the moſt eminent painters furniſh us with examples of the moſt unceaſing induſtry. When they conceived a ſubject, they firſt made a variety of ſketches; then a finiſhed drawing of the whole; after that a more correct drawing of every ſeparate part, heads, hands, feet, and pieces of drapery; they then painted the picture, and after all retouched it from the life. The pictures thus wrought with ſuch care, now appear like the effects of enchantment, and as if ſome mighty genius had ſtruck them off at a blow.

But a ſtudent is not always advancing becauſe he is employed; he muſt apply his ſtrength to that part of the art where the real difficulties lie; to that part which diſtinguiſhes it as a liberal art, and not by miſtaken induſtry loſe his time in that which is merely ornamental. The ſtudents, inſtead of vying with each other who ſhall have the readieſt hand, ſhould be taught to labour who ſhall have the pureſt and moſt correct outline; inſtead of ſtriving who ſhall produce the brighteſt tint, or endeavouring to give the gloſs of ſtuffs ſo as to make them appear real, let their ambition be directed to contend, who ſhall diſpoſe his drapery in the moſt graceful folds, and give the greateſt dignity to the human form.

He who endeavours to copy accurately the figure before him, not only acquires a habit of exactneſs and preciſion, but is continually advancing in his knowledge of the human figure; and though he ſeems to ſuperficial obſervers to make a ſlower progreſs, he will be found at laſt capable of adding (without running into capricious wildneſs) that grace and beauty which is neceſſary to be given to his more finiſhed works, and which cannot be got by the moderns, as it was not acquired by the ancients, but by an attentive and well-directed ſtudy of the human form.

2. It is, in the next place, a matter of great importance, that the drawings on which the young artiſt firſt exerciſes his talents be of the moſt excellent kind. Let the profiles, the hands, and the feet given him to copy, be of the beſt maſters, ſo as to bring his eye and his hand early acquainted with the moſt elegant forms and the moſt beautiful proportions. A painter who has early acquired a fine taſte, finds it an eaſy matter to give dignity to the meaneſt features, while even the works of a Praxiteles or a Glycon are ſeen to ſuffer in the hands of another. A veſſel will ever retain the ſcent which it has firſt contracted.

3. It would be proper alſo to make the pupil copy ſome fine heads from the Greek and Roman medals; not ſo much for the reaſon juſt laid down, as to make him acquainted, if we may uſe the expreſſion, with thoſe perſonages which in time he may have occaſion to introduce into his pieces, and, above all, to improve him early in the art of copying from relief. Hence he will learn the rationale of light and ſhade, and the nature of that chiaro-ſcuro by which it is, properly ſpeaking, that the various forms of things are diſtinguiſhed.

There is no danger of ſtudying too much the works of the greateſt maſters, either in painting or ſculpture; but how they may be ſtudied to advantage is an inquiry of great importance. "Some (ſays Sir Joſhua Reynolds), who have never raiſed their minds to the conſideration of the real dignity of the art, and who rate the works of an artiſt in proportion as they excel or are defective in the mechanical parts, look on theory as ſomething that may enable them to talk, but not to paint better; and, confining themſelves entirely to mechanical practice, very aſſiduouſly toil in the drudgery of copying, and think they make a rapid progreſs, while they faithfully exhibit the minuteſt part of a favourite picture. This appears to me a very tedious, and, I think, a very erroneous method of proceeding. Of every large compoſition, even of thoſe which are moſt admired, a great part may be truly ſaid to be common place. This, though it takes up much time in copying, conduces little to improvement. I conſider general copying as a deluſive kind of induſtry: the ſtudent ſatisfies himſelf with the appearance of doing ſomething; he falls into the dangerous habit of imitating without ſelecting, and of labouring without any determinate object: as it requires no effort of the mind, he ſleeps over his work; and thoſe powers of invention and compoſition which ought particularly to be called out, and put in action, lie torpid, and loſe their energy for want of exerciſe.

"However, as the practice of copying is not entirely to be excluded, ſince the mechanical practice of painting is learned in ſome meaſure by it, let thoſe choice parts only be ſelected which have recommended the work to notice. If its excellence conſiſts in its general effect, it will be proper to make ſlight ſketches of the machinery and general management of the picture. Thoſe ſketches ſhould be kept always by you, for the regulation of your ſtyle. Inſtead of copying the touches of thoſe great maſters, copy only their conceptions. Inſtead of treading in their footſteps, endeavour only to keep the ſame road. Labour to invent on their general principles and way of thinking. Poſſeſs yourſelf with their ſpirit. Conſider with yourſelf how a Michael Angelo or a Raphael would have treated this ſubject, and work yourſelf into a belief that your picture is to be ſeen and criticiſed by them when completed. Even an attempt of this kind will rouſe your powers."

The ſame great maſter recommends to ſtudents to keep their minds fixed on the higheſt excellencies.—"If you compaſs them, and compaſs nothing more, you are ſtill in the firſt claſs. We may regret the innumerable beauties which you may want: you may be very imperfect; but ſtill you are an imperfect perſon of the higheſt order.

"I inculcate as frequently as I can your forming yourſelves upon great principles and great models.—Your time will be much miſpent in every other purſuit. Small excellencies ſhould be viewed, not ſtudied; they ought to be viewed, becauſe nothing ought to eſcape a painter's obſervation, but for no other reaſon.

"There is another caution which I wiſh to give you. Be as ſelect in thoſe whom you endeavour to pleaſe, as in thoſe whom you endeavour to imitate. Without the love of fame you can never do any thing excellent; but by an exceſſive and undiſtinguiſhing thirſt after it, you will come to have vulgar views; you you will degrade your ſtyle; and your taſte will be entirely corrupted. It is certain that the loweſt ſtyle will be the moſt popular, as it falls within the compaſs of ignorance itſelf, and the vulgar will always be pleaſed with what is natural in the confined and miſunderſtood ſenſe of the word."

Genius he conſiders as an improveable talent, never to be deſtroyed by the moſt exceſſive, if well directed, application, and diſplaying the elegancies of the art in proportion to the number of ideas which have been carefully collected and digeſted in the mind.

He cautions painters, therefore, in every ſtage of their progreſs, to beware of that falſe opinion, but too prevalent among artiſts, of the imaginary power of native genius, and its ſufficiency in great works.

This opinion, according to the temper of mind it meets with, almoſt always produces, either a vain confidence or a ſluggiſh deſpair, both equally fatal to all proficiency. "Study, therefore, the great works of the great maſters for ever. Study, as nearly as you can, in the order, in the manner, on the principles on which they ſtudied. Study nature attentively, but always with thoſe maſters in your company: conſider them as models which you are to imitate, and at the ſame time as rivals whom you are to combat.

PART II. Of the Different CLASSES of PAINTING.

SECT. I. *General Enumeration.*

AS all the objects in nature are ſuſceptible of imitation by the pencil, the maſters of this art have applied themſelves to different ſubjects, each one as his talents, his taſte, or inclination may have led him.—From whence have ariſen the following claſſes.

I. *Hiſtory-painting:* which repreſents the principal events in hiſtory ſacred and profane, real or fabulous; and to this claſs belongs *allegorical expreſſion*. Theſe are the moſt ſublime productions of the art; and in which Raphael, Guido, Rubins, Le Brun, &c. have excelled.

II. *Rural-hiſtory;* or the repreſentation of a country life, of villages and hamlets, and their inhabitants. This is an inferior claſs; and in which Teniers, Breughel, Watteau, &c. have great reputation, by rendering it at once pleaſing and graceful.

III. *Portrait-painting;* which is an admirable branch of this art, and has engaged the attention of the greateſt maſters in all ages, as Appelles, Guido, Vandyke, Rembrandt, Regauds, Peſne, Kneller, La Tour, &c.

IV. *Groteſque hiſtories;* as the nocturnal meetings of witches, ſorceries and incantations; the operations of mountebanks, &c. a ſort of painting in which the younger Breughill, Teniers, and others, have exerciſed their talents with ſucceſs.

V. *Battle-pieces;* by which Huchtemberg, Wouwerman, &c. have rendered themſelves famous.

VI. *Landſcapes;* a charming ſpecies of painting, that has been treated by maſters of the greateſt genius in every nation.

VII. *Landſcapes diverſified with waters,* as rivers, lakes, cataracts, &c.; which require a peculiar talent, to expreſs the water ſometimes ſmooth and tranſparent,

parent, and at others foaming and ruſhing furiouſly along.

VIII. *Sea-pieces*; in which are repreſented the ocean, harbours, and great rivers; and the veſſels, boats, barges, &c. with which they are covered; ſometimes in a calm, ſometimes with a freſh breeze, and at others in a ſtorm. In this claſs Backhuyſen, Vandervelde, Blome, and many others, have acquired great reputation.

IX. *Night-pieces;* which repreſent all ſorts of objects, either as illuminated by torches, by the flames of a conflagration, or by the light of the moon. Schalk, Vanderneer, Vanderpoul, &c. have here excelled.

X. *Living Animals:* A more difficult branch of painting than is commonly imagined; and in which Roſa, Carré, Vandervelde, and many others, have ſucceeded marvellouſly well.

XI. *Birds of all kinds*; a very laborious ſpecies, and which requires extreme patience minutely to expreſs the infinite variety and delicacy of their plumage.

XII. *Culinary-pieces;* which repreſent all ſorts of proviſions, and animals without life, &c. A ſpecies much inferior to the reſt, in which nature never appears to advantage, and which requires only a ſervile imitation of objects that are but little pleaſing. The painting of fiſhes is naturally referred to this claſs.

XIII. *Fruit-pieces*, of every kind, imitated from nature.

XIV. *Flower-pieces;* a charming claſs of painting, where Art in the hands of Huyzum, P. Segerts, Merian, &c. becomes the rival of Nature *Plants* and *inſects* are uſually referred to the painters of flowers, who with them ornament their works.

XV. *Pieces of architecture;* a kind of painting in which the Italians excel all others. Under this claſs may be comprehended the repreſentations of ruins, ſea-ports, ſtreets, and public places; ſuch as are ſeen in the works of Canaletti, and other able maſters.

XVI. *Inſtruments of muſic, pieces of furniture*, and other inanimate objects; a trifling ſpecies, and in which able painters only accidentally employ their talents.

XVII. *Imitations of bas reliefs;* a very pleaſing kind of painting, and which may be carried by an able hand to a high degree of excellence.

XVIII. *Hunting-pieces:* theſe alſo require a peculiar talent, as they unite the painting of men, horſes, dogs, and game, to that of landſcapes.

It will not be expected that we ſhould here give the rules that the painter is to obſerve in handling each particular ſubject. What has been ſaid on hiſtorical painting (Part I.*) may throw ſome light on the reſt, and the particular rules muſt be learned from the ſtudy of the art itſelf. Good maſters, academies of reputation, and a rational practice, are the ſources from whence the young painter muſt derive the detail of his art. We ſhall however inſert ſome rules and obſervations relative to *Landſcape* and *Portrait;* theſe, with *Hiſtory painting* (already pretty fully treated), forming the principal branches of the art.

* In the ſections of *Invention* and *Diſpoſition*.

SECT II. *Of Landſcapes.*

LANDSCAPE-painting includes every object that the country preſents: and it is diſtinguiſhed into the *heroic*, and the *paſtoral* or *rural*; of which indeed all other ſtyles are but mixtures.

De Piles on Painting.

The *heroic ſtyle* is a compoſition of objects, which in their kinds draw both from art and nature every thing that is great and extraordinary in either. The ſituations are perfectly agreeable and ſurpriſing. The only buildings are temples, pyramids, ancient places of burial, altars conſecrated to the divinities, pleaſure-houſes of regular architecture; and if nature appear not there as we every day caſually ſee her, ſhe is at leaſt repreſented as we think ſhe ought to be. This ſtyle is an agreeable illuſion, and a ſort of enchantment, when handled by a man of fine genius and a good underſtanding, as Pouſſin was, who has ſo happily expreſſed it. But if, in the courſe of this ſtyle, the painter has not talent enough to maintain the ſublime, he is often in danger of falling into the childiſh manner.

The *rural ſtyle* is a repreſentation of countries, rather abandoned to the caprice of nature, than cultivated: we there ſee nature ſimple, without ornament, and without artifice; but with all thoſe graces wherewith ſhe adorns herſelf much more when left to herſelf than when conſtrained by art.

In this ſtyle, ſituations bear all ſorts of varieties: ſometimes they are very extenſive and open, to contain the flocks of the ſhepherds; at others very wild, for the retreat of ſolitary perſons, and a cover for wild beaſts.

It rarely happens that a painter has a genius extenſive enough to embrace all the parts of painting: there is commonly ſome one part that pre-engages our choice, and ſo fills our mind, that we forget the pains that are due to the other parts; and we ſeldom fail to ſee, that thoſe whoſe inclination leads them to the heroic ſtyle, think they have done all, when they have introduced into their compoſitions ſuch noble objects as will raiſe the imagination, without ever giving themſelves the trouble to ſtudy the effects of good colouring. Thoſe, on the other hand, who practiſe the paſtoral, apply cloſely to colouring, in order to repreſent truth more lively. Both theſe ſtyles have their ſectaries and partiſans. Thoſe who follow the heroic, ſupply by their imagination what it wants of truth, and they look no farther.

As a counterbalance to heroic landſcape, it would be proper to put into the paſtoral, beſides a great character of truth, ſome affecting, extraordinary, but probable effect of nature, as was Titian's cuſtom.

There is an infinity of pieces wherein both theſe ſtyles happily meet; and which of the two has the aſcendant, will appear from what we have been juſt obſerving of their reſpective properties. The chief parts of landſcapes are, their openings or ſituations, accidents, ſkies and clouds, offskips and mountains, verdure or turfing, rocks, grounds, or lands, terraces, fabrics, waters, fore-grounds, plants, figures, and trees; of all which in their places

Of Openings or Situations. The word *ſite*, or ſituation, ſignifies the "view, proſpect, or opening of a country." It is derived from the Italian word *ſito*; and our painters have brought it into uſe, either becauſe they were uſed to it in Italy, or becauſe, as we think, they found it to be very expreſſive.

Situations ought to be well put together; and ſo diſengaged in their make, that the conjunction of grounds may not ſeem to be obſtructed, though we ſhould ſee but a part of them.

Situations are various, and repreſented according to the country the painter is thinking of: as either open or cloſe, mountainous or watery, tilled and inhabited, or wild and lonely; or, in fine, variegated by a prudent mixture of ſome of theſe. But if the painter be obliged to imitate nature in a flat and regular country, he muſt make it agreeable by a good diſpoſition of the *claro-obſcuro*, and ſuch pleaſing colouring as may make one ſoil unite with another.

It is certain, that extraordinary ſituations are very pleaſing, and cheer the imagination by the novelty and beauty of their makes, even when the local colouring is but moderately performed: becauſe, at worſt, ſuch pictures are only looked on as unfiniſhed, and wanting to be completed by ſome ſkilful hand in colouring; whereas common ſituations and objects require good colouring and abſolute finiſhing, in order to pleaſe. It was only by theſe properties that Claude Lorrain has made amends for his inſipid choice in moſt of his ſituations. But in whatever manner that part be executed, one of the beſt ways to make it valuable, and even to multiply and vary it without altering its form, is properly to imagine ſome ingenious accident in it.

Of Accidents. An accident in painting is an obſtruction of the ſun's light by the interpoſition of clouds, in ſuch manner, that ſome parts of the earth ſhall be in light and others in ſhade, which, according to the motion of the clouds, ſucceed each other, and produce ſuch wonderful effects and changes of the *claro-obſcuro*, as ſeem to create ſo many new ſituations. This is daily obſerved in nature. And as this newneſs of ſituations is grounded only on the ſhapes of the clouds, and their motions, which are very inconſtant and unequal, it follows, that theſe accidents are arbitrary; and a painter of genius may diſpoſe them to his own advantage when he thinks fit to uſe them: For he is not abſolutely obliged to do it; and there have been ſome able landſcape-painters who have never practiſed it, either through fear or cuſtom, as Claude Lorrain and ſome others.

Of the Sky and Clouds. The ſky, in painters terms, is the ethereal part over our heads; but more particularly the air in which we breathe, and that where clouds and ſtorms are engendered. Its colour is blue, growing clearer as it approaches the earth, becauſe of the interpoſition of vapours ariſing between the eye and the horizon; which, being penetrated by the light, communicates it to objects in a greater or leſſer degree, as they are more or leſs remote.

But we muſt obſerve, that this light being either yellow or reddiſh in the evening, at ſunſet, theſe ſame objects partake not only of the light, but of the colour: thus the yellow light mixing with the blue, which is the natural colour of the ſky, alters it, and gives it a tint more or leſs greeniſh, as the yellowneſs of the light is more or leſs deep.

This obſervation is general and infallible: but there is an infinity of particular ones, which the painter muſt make upon the natural, with his pencil in his hand, when occaſion offers; for there are very fine and ſingular effects appearing in the ſky, which it is difficult to make one conceive by phyſical reaſons. Who can tell, for example, why we ſee, in the bright part of ſome clouds, a fine red, when the ſource of the light which plays upon them is a moſt lively and diſtinguiſhing yellow? Who can account for the different reds ſeen in different clouds, at the very moment that theſe reds receive the light but in one place? for theſe colours and ſurpriſing appearances ſeem to have no relation to the rainbow, a phenomenon for which the philoſopher pretends to give ſolid reaſons.

Theſe effects are all ſeen in the evening when the weather is inclining to change, either before a ſtorm, or after it, when it is not quite gone, but has left ſome remains of it to draw our attention.

The property of clouds is to be thin and airy, both in ſhape and colour: their ſhapes, though infinite, muſt be ſtudied and choſen after nature, at ſuch times as they appear fine. To make them look thin, we ought to make their grounds unite thinly with them, eſpecially near their extremities, as if they were tranſparent: And if we would have them thick, their reflections muſt be ſo managed, as, without deſtroying their thinneſs, they may ſeem to wind and unite, if neceſſary, with the clouds that are next to them. Little clouds often diſcover a little manner, and ſeldom have a good effect, unleſs when, being near each other, they ſeem altogether to make but one object.

In ſhort, the character of the ſky is to be luminous; and, as it is even the ſource of light, every thing that is upon the earth muſt yield to it in brightneſs: If, however, there is any thing that comes near it in light, it muſt be waters, and poliſhed bodies which are ſuſceptible of luminous reflections.

But whilſt the painter makes the ſky luminous, he muſt not repreſent it always ſhining throughout.

On the contrary, he muſt contrive his light ſo, that the greateſt part of it may fall only upon one place: and, to make it more apparent, he muſt take as much care as poſſible to put it in oppoſition to ſome terreſtrial object, that may render it more lively by its dark colour; as a tree, tower, or ſome other building that is a little high.

This principal light might alſo be heightened, by a certain diſpoſition of clouds having a ſuppoſed light, or a light ingeniouſly incloſed between clouds, whoſe ſweet obſcurity ſpreads itſelf by little and little on all hands. We have a great many examples of this in the Flemiſh ſchool, which beſt underſtood landſcape; as Paul Bril, Brugel, Saveri: And the Sadelers and Merian's prints give a clear idea of it, and wonderfully awaken the genius of thoſe who have the principles of the *claro-ſcuro*.

Of Offskips and Mountains. Offskips have a near affinity with the ſky; it is the ſky which determines either the force of faintneſs of them. They are darkeſt when the ſky is moſt loaded, and brighteſt when it is moſt clear. They ſometimes intermix their ſhapes and lights; and there are times, and countries, where the clouds paſs between the mountains, whoſe tops riſe and appear above them. Mountains that are high, and covered with ſnow, are very proper to produce extraordinary effects in the offskip, which are advantageous to the painter, and pleaſing to the ſpectator.

The diſpoſition of offskips is arbitrary; let them only

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only agree with the whole together of the picture, and the nature of the country we would repreſent. They are uſually blue, becauſe of the interpoſition of air between them and the eye: but they loſe this colour by degrees, as they come nearer the eye, and ſo take that which is natural to the objects.

In diſtancing mountains, we muſt obſerve to join them inſenſibly by the roundings off, which the reflections make probable; and muſt, among other things, avoid a certain edgineſs in their extremities, which makes them appear in ſlices, as if cut with ſciſſars, and ſtuck upon the cloth.

We muſt further obſerve, that the air, at the feet of mountains, being charged with vapours, is more ſuſceptible of light than at their tops. In this caſe, we ſuppoſe the main light to be ſet reaſonably high, and to enlighten the mountains equally, or that the clouds deprive them of the light of the ſun. But if we ſuppoſe the main light to be very low, and to ſtrike the mountains, then their tops will be ſtrongly enlightened, as well as every thing elſe in the ſame degree of light.

Though the forms of things diminiſh in bigneſs, and colours loſe their ſtrength, in proportion as they recede from the firſt plan of the picture, to the moſt remote offskip, as we obſerve in nature and common practice; yet this does not exclude the uſe of the accidents. Theſe contribute greatly to the wonderful in landſcape, when they are properly introduced, and when the artiſt has a juſt idea of their good effects.

Of Verdure, or Turfing. By turfing is meant the greenneſs with which the herbs colour the ground: This is done ſeveral ways; and the diverſity proceeds not only from the nature of plants, which, for the moſt part, have their particular verdures, but alſo from the change of ſeaſons, and the colour of the earth, when the herbs are but thin ſown. By this variety, a painter may chooſe or unite, in the ſame tract of land, ſeveral ſorts of greens, intermixed and blended together, which are often of great ſervice to thoſe who know how to uſe them; becauſe this diverſity of greens, as it is often found in nature, gives a character of truth to thoſe parts, where it is properly uſed. There is a wonderful example of this part of landſcape, in the view of Mechlin, by Rubens.

Of Rocks. Though rocks have all ſorts of ſhapes, and participate of all colours, yet there are in their diverſity, certain characters which cannot be well expreſſed without having recourſe to nature. Some are in banks, and ſet off with beds of ſhrubs; others in huge blocks, either projecting or falling back; others conſiſt of large broken parts, contiguous to each other; and others, in ſhort, of an enormous ſize, all in one ſtone, either naturally, as free-ſtone, or elſe through the injuries of time, which in the courſe of many ages has worn away their marks of ſeparation. But, whatever their form be, they are uſually ſet out with clefts, breaks, hollows, buſhes, moſs, and the ſtains of time; and theſe particulars, well managed, create a certain idea of truth.

Rocks are of themſelves gloomy, and only proper for ſolitudes: but where accompanied with buſhes, they inſpire a freſh air; and when they have waters, either proceeding from, or waſhing them, they give an infinite pleaſure, and ſeem to have a ſoul which animates them, and makes them ſociable.

Of Grounds or Lands. A ground or land, in painters terms, is a certain diſtinct piece of land, which is neither too woody nor hilly. Grounds contribute, more than any thing, to the gradation and diſtancing of landſcape; becauſe they follow one another, either in ſhape, or in the *claro-obſcuro*, or in their variety of colouring, or by ſome inſenſible conjunction of one with another.

Multiplicity of grounds, though it be often contrary to grand manner, does not quite deſtroy it; for, beſides the extent of country which it exhibits, it is ſuſceptible of the accidents we have mentioned, and which, with good management, have a fine effect.

There is one nicety to be obſerved in grounds, which is, that in order to characterize them well, care muſt be taken, that the trees in them have a different verdure and different colours from thoſe grounds; though this difference, withal, muſt not be too apparent.

Of Terraces. A terrace in painting, is a piece of ground, either quite naked or having very little herbage, like great roads and places often frequented. They are of uſe chiefly in the foregrounds of a picture, where they ought to be very ſpacious and open, and accompanied, if we think fit, with ſome accidental verdure, and alſo with ſome ſtones, which, if placed with judgment, give a terrace a greater air of probability.

Of Buildings. Painters mean by buildings any ſtructures they generally repreſent, but chiefly ſuch as are of a regular architecture, or at leaſt are moſt conſpicuous. Thus building is not ſo proper a name for the houſes of country-people, or the cottages of ſhepherds, which are introduced into the *rural* taſte, as for regular and ſhowy edifices, which are always brought into the *heroic*.

Buildings in general are a great ornament in landſcapes, even when they are Gothic, or appear partly inhabited and partly ruinous: they raiſe the imagination by the uſe they are thought to be deſigned for; as appears from ancient towers, which ſeem to have been the habitations of fairies, and are now retreats for ſhepherds and owls.

Pouſſin has very elegantly handled the Roman manner of architecture in his works, as Bourdon has done the Gothic; which, however Gothic, fails not to give a ſublime air to his landſcapes. Little Bernard has introduced into his ſacred hiſtory what may be called a Babylonian manner; which, extraordinary as it is, has its grandeur and magnificence. Nor ought ſuch pieces of architecture to be quite rejected: they raiſe the imagination; and perhaps would ſucceed in the heroic ſtyle, if they were placed among half-diſtant objects, and if we knew how to uſe them properly.

Of Waters. Much of the ſpirit of landſcape is owing to the waters which are introduced in it. They appear in divers manners; ſometimes impetuous, as when a ſtorm makes them overflow their banks; at other times rebounding, as by the fall of a rock; at other times, through unuſual preſſure, guſhing out and dividing into an infinity of ſilver ſtreams, whoſe motion and murmuring agreeably deceive both the eye and

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ear; at other times calm and purling in a ſandy bed; at other times ſo ſtill and ſtanding, as to become a faithful looking-glaſs, which doubles all the objects that are oppoſite to it; and in this ſtate they have more life than in the moſt violent agitation. Conſult Bourdon's works, or at leaſt his prints, on this ſubject: he is one of thoſe who have treated of waters with the greateſt ſpirit and beſt genius.

Waters are not proper for every ſituation: but to expreſs them well, the artiſt ought to be perfect maſter of the exactneſs of watery reflections; becauſe they only make painted water appear as real: for practice alone, without exactneſs, deſtroys the effect, and abates the pleaſure of the eye. The rule for theſe reflections is very eaſy, and therefore the painter is the leſs pardonable for neglecting it.

But it muſt be obſerved, that though water be as a looking glaſs, yet it does not faithfully repreſent objects but when it is ſtill; for if it be in any motion, either in a natural courſe, or by the driving of the wind, its ſurface becoming uneven, receives on its ſurges ſuch lights and ſhades as, mixing with the appearance of the objects, confound both their ſhapes and colours.

Of the Foreground of a Picture. As it is the part of the foreground to uſher the eye into the piece, great care muſt be taken that the eye meet with good reception; ſometimes by the opening of a fine terrace, whoſe deſign and workmanſhip may be equally curious; ſometimes by a variety of well-diſtinguiſhed plants, and thoſe ſometimes flowered; and at other times, by figures in a lively taſte, or other objects, either admirable for their novelty or introduced as by chance.

In a word, the artiſt cannot too much ſtudy his foreground objects, ſince they attract the eye, impreſs the firſt character of truth, and greatly contribute to make the artifice of a picture ſucceſsful, and to anticipate our eſteem for the whole work.

Of Plants. Plants are not always neceſſary in foregrounds, becauſe, as we have obſerved, there are ſeveral ways of making thoſe grounds agreeable. But if we reſolve to draw plants there, we ought to paint them exactly after the life; or at leaſt, among ſuch as we paint practically, there ought to be ſome more finiſhed than the reſt, and whoſe kinds may be diſtinguiſhed by the difference of deſign and colouring, to the end that, by a probable ſuppoſition, they may give the others a character of truth. What has been ſaid here of plants may be applied to the branches and barks of trees.

Of Figures. In compoſing landſcape, the artiſt may have intended to give it a character agreeable to the ſubject he has choſen, and which his figures ought to repreſent. He may alſo, and it commonly happens, have only thought of his figures, after finiſhing his landſcape. The truth is, the figures in moſt landſcapes are made rather to accompany than to ſuit them.

It is true, there are landſcapes ſo diſpoſed and ſituated, as to require only paſſing figures; which ſeveral good maſters, each in his ſtyle, have introduced, as Pouſſin in the heroic, and Fouquier in the rural, with all probability and grace. It is true alſo, that reſting figures have been made to appear inwardly active. And theſe two different ways of treating figures are not to be blamed, becauſe they act equally, though

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in a different manner. It is rather inaction that ought to be blamed in figures; for in this condition, which robs them of all connection with the landſcape, they appear to be paſted on. But without obſtructing the painter's liberty in this reſpect, undoubtedly the beſt way to make figures valuable is, to make them ſo to agree with the character of the landſcape, that it may ſeem to have been made purely for the figures. We would not have them either inſipid or indifferent, but to repreſent ſome little ſubject to awaken the ſpectator's attention, or elſe to give the picture a name of diſtinction among the curious.

Great care muſt be taken to proportion the ſize of the figures to the bigneſs of the trees, and other objects of the landſcape. If they be too large, the picture will diſcover a little manner; and if too ſmall, they will have the air of pigmies; which will deſtroy the worth of them, and make the landſcape look enormous. There is, however, a greater inconvenience in making figures too large than too ſmall; becauſe the latter at leaſt gives an air of greatneſs to all the reſt. But as landſcape figures are generally ſmall, they muſt be touched with ſpirit, and ſuch lively figures as will attract, and yet preſerve probability and a general union. The artiſt muſt, in fine, remember, that as the figures chiefly give life to a landſcape, they muſt be diſperſed as conveniently as poſſible.

Of Trees. The beauty of trees is perhaps one of the greateſt ornaments of landſcape; on account of the variety of their kinds, and their freſhneſs, but chiefly their lightneſs, which makes them ſeem, as being expoſed to the air, to be always in motion.

Though diverſity be pleaſing in all the objects of landſcape, it is chiefly in trees that it ſhows its greateſt beauty. Landſcape conſiders both their kinds and their forms. Their kinds require the painter's particular ſtudy and attention, in order to diſtinguiſh them from each other; for we muſt be able at firſt ſight to diſcover which are oaks, elms, firs, ſycamores, populars, willows, pines, and other ſuch trees, which, by a ſpecific colour, or touching, are diſtinguiſhable from all other kinds. This ſtudy is too large to be acquired in all its extent; and, indeed, few painters have attained ſuch a competent exactneſs in it as their art requires. But it is evident, that thoſe who come neareſt to perfection in it, will make their works infinitely pleaſing, and gain a great name.

Beſides the variety which is found in each kind of tree, there is in all trees a general variety This is obſerved in the different manners in which their branches are diſpoſed by a ſport of nature; which takes delight in making ſome very vigorous and thick, others more dry and thin; ſome more green, others more red or yellow. The excellence of practice lies in the mixture of theſe varieties: but if the artiſt can diſtinguiſh the ſorts but indifferently, he ought at leaſt to vary their makes and colours; becauſe repetition in landſcape is as tireſome to the eye, as monotony in diſcourſe is to the ear.

The variety of their makes is ſo great, that the painter would be inexcuſable not to put it in practice upon occaſion, eſpecially when he finds it neceſſary to awaken the ſpectator's attention; for, among trees, we diſcover the young and the old, the open and cloſe, tapering and ſquat, bending upwards and downwards, ſtooping and ſhooting: in ſhort, the variety is rather to be conceived than expreſſed. For inſtance, the character of young trees is, to have long ſlender branches, few in number, but well ſet out; boughs well divided, and the foliage vigorous and well ſhaped: whereas, in old trees, the branches are ſhort, ſtocky, thick, and numerous; the tufts blunt, and the foliage unequal and ill ſhaped: but a little obſervation and genius will make us perfectly ſenſible of theſe particulars.

In the various makes of trees, there muſt alſo be a diſtribution of branches, that has a juſt relation to, and probable connection with, the boughs or tufts, ſo as mutually to aſſiſt each other in giving the tree an appearance of thickneſs and of truth. But, whatever their natures or manners of branching be, let it be remembered, that the handling muſt be lively and thin, in order to preſerve the ſpirit of their characters.

Trees likewiſe vary in their barks, which are commonly grey; but this grey, which in thick air, and low and marſhy places, looks blackiſh, appears lighter in a clear air: and it often happens, in dry places, that the bark gathers a thin moſs, which makes it look quite yellow; ſo that, to make the bark of a tree apparent, the painter may ſuppoſe it to be light upon a dark ground, and dark on a light one.

The obſervation of the different barks merits a particular attention; for it will appear, that, in hard woods, age chaps them, and thereby gives them a ſort of embroidery; and that, in proportion as they grow old, theſe chaps grow more deep. And other accidents in barks may ariſe either from moiſture, or dryneſs, or green moſſes, or white ſtains of ſeveral trees.

The barks of white woods will alſo afford much matter for practice, if their diverſity be duly ſtudied; and this conſideration leads us to ſay ſomething of the ſtudy of landſcape.

Of the Study of Landſcape. The ſtudy of landſcape may be conſidered either with reſpect to beginners, or to thoſe who have made ſome advances in it.

Beginners will find, in practice, that the chief trouble of landſcape lies in handling trees; and it is not only in practice, but alſo in ſpeculation, that trees are the moſt difficult part of landſcape, as they are its greateſt ornament. But it is only propoſed here, to give beginners an idea of trees in general, and to ſhow them how to expreſs them well. It would be needleſs to point out to them the common effects of trees and plants, becauſe they are obvious to every one; yet there are ſome things, which, though not unknown, deſerve our reflection. We know, for inſtance, that all trees require air, ſome more, ſome leſs, as the chief cauſe of their vegetation and production; and for this reaſon, all trees (except the cypreſs, and ſome others of the ſame kind) ſeparate in their growth from one another, and from other ſtrange bodies as much as poſſible, and their branches and foliage do the ſame: wherefore, to give them that air and thinneſs, which is their principal character, the branches, boughs, and foliage, muſt appear to fly from each other, to proceed from oppoſite parts, and be well divided And all this without order; as if chance aided nature in the fanciful diverſity. But to ſay particularly how theſe trunks, branches, and foliages, ought to be diſtributed, would be needleſs, and only a deſcription of the works of great maſters: a little reflection on nature will be of more ſervice than all that can be ſaid on this head. By great maſters, we mean ſuch as have publiſhed prints; for thoſe will give better ideas to young copyiſts than even the paintings themſelves.

Among the many great maſters of all ſchools, De Piles prefers Titian's wooden prints, where the trees are well ſhaped; and thoſe which Cornelius Cort and Agoſtino Carracci have engraved. And he aſſerts, that beginners can do no better than contract, above all things, an habit of imitating the touches of theſe great maſters, and of conſidering at the ſame time the perſpective of the branches and foliages, and obſerving how they appear, either when riſing and ſeen from below, or when ſinking and ſeen from above, or when fronting and viewed from a point, or when they appear in profile; and, in a word, when ſet in the various views in which nature preſents them, without altering their characters.

After having ſtudied and copied with the pen or crayon, firſt the prints, and then the deſigns of Titian and Carracci, the ſtudent ſhould imitate with the pencil thoſe touches which they have moſt diſtinctly ſpecified, if their paintings can be procured: but ſince they are ſcarce, others ſhould be got which have a good character for their touching; as thoſe of Foquier, who is a moſt excellent model: Paul Bril, Breugel, and Bourdon, are alſo very good; their touching is neat, lively, and thin.

After having duly weighed the nature of trees, their ſpread and order, and the diſpoſition of their branches, the artiſt muſt get a lively idea of them, in order to keep up the ſpirit of them throughout, either by making them apparent and diſtinct in the foregrounds, or obſcure and confuſed in proportion to their diſtance.

After having thus gained ſome knowledge in good manner, it will next be proper to ſtudy after nature, and to chooſe and rectify it according to the idea which the aforeſaid great maſters had of it. As to perfection, it can only be expected from long practice and perſeverance. On the whole, it is proper for thoſe who have an inclination for landſcape, above all things to take the proper methods for beginning it well.

As for thoſe, who have made ſome advances in this part of painting, it is proper they ſhould collect the neceſſary materials for their further improvement, and ſtudy thoſe objects at leaſt which they ſhall have moſt frequent occaſion to repreſent.

Painters uſually compriſe, under the word *ſtudy*, any thing whatever which they either deſign or paint ſeparately after the life; whether figures, heads, feet, hands, draperies, animals, mountains, trees, plants, flowers, fruits, or whatever may confirm them in the juſt imitation of nature: the drawing of theſe things is what they call *ſtudy*; whether they be for inſtruction in deſign, or only to aſſure them of the truth, and to perfect their work. In fact, this word *ſtudy* is the more properly uſed by painters, as in the diverſity of nature they are daily making new diſcoveries, and confirming themſelves in what they already know.

As the landſcape-painter need only ſtudy ſuch objects as are to be met with in the country, we would recommend to him ſome order, that his drawings may be always at hand when he wants them. For inſtance, he ſhould copy after nature, on ſeparate papers, the different effects of trees in general, and the different effects of each kind in particular, with their trunks, foliage, and colours. He ſhould alſo take the ſame method with ſome ſorts of plants, becauſe their variety is a great ornament to terraces on fore-grounds. He ought likewiſe to ſtudy the effects of the ſky in the ſeveral times of the day and ſeaſons of the year, in the various diſpoſitions of clouds, both in ſerene, thundering, and ſtormy weather; and in the offskip, the ſeveral ſorts of rocks, waters, and other principal objects.

Theſe drawings, which may be made at different times, ſhould be collected together; and all that relate to one matter be put into a book, to which the artiſt may have recourſe at any time for what he wants.

Now, if the fine effects of nature, whether in ſhape or colour, whether for an entire picture or a part of one, be the artiſt's ſtudy; and if the difficulty lies in chooſing thoſe effects well, he muſt for this purpoſe be born with good ſenſe, good taſte, and a fine genius; and this genius muſt be cultivated by the obſervations which ought to be made on the works of the beſt maſters, how they chooſe nature, and how, while they corrected her, according to their art, they preſerved her character. With theſe advantages, derived from nature and perfected by art, the painter cannot fail to make a good choice; and, by diſtinguiſhing between the good and the bad, muſt needs find great inſtruction even from the moſt common things.

To improve themſelves in this kind of ſtudies, painters have taken ſeveral methods.

There are ſome artiſts who have deſigned after nature, and in the open fields; and have there quite finiſhed thoſe parts which they had choſen, but without adding any colour to them.

Others have drawn, in oil colours, in a middle tint, on ſtrong paper; and found this method convenient, becauſe, the colours ſinking, they could put colour on colour, though different from each other. For this purpoſe they took with them a flat box, which commodiouſly held their pallet, pencils, oil, and colours. This method, which indeed requires ſeveral implements, is doubtleſs the beſt for drawing nature more particularly, and with greater exactneſs, eſpecially if, after the work be dry and varniſhed, the artiſt return to the place where he drew, and retouch the principal things after nature.

Others have only drawn the outlines of objects, and ſlightly waſhed them in colours near the life, for the eaſe of their memory. Others have attentively obſerved ſuch parts they had a mind to retain, and contented themſelves with committing them to their memory, which upon occaſion gave them a faithful account of them. Others have made drawings in paſtil and waſh together. Others, with more curioſity and patience, have gone ſeveral times to the places which were to their taſte: the firſt time they only made choice of the parts, and drew them correctly; and the other times were ſpent in obſerving the variety of colouring, and its alterations through change of light.

Now theſe ſeveral methods are very good, and each may be practiſed as beſt ſuits the ſtudent and his temper: but they require the neceſſaries of painting, as colours, pencils, paſtils, and leiſure. Nature, however, at certain times, preſents extraordinary but tranſient beauties, and ſuch as can be of no ſervice to the artiſt who has not as much time as is neceſſary to imitate what he admires. The beſt way, perhaps, to make advantage of ſuch momentary occaſions, is this:

The painter being provided with a quire of paper, and a black-lead pencil, let him quickly, but ſlightly, deſign what he ſees extraordinary; and, to remember the colouring, let him mark the principal parts with characters, which he may explain at the bottom of the paper, as far as is neceſſary for himſelf to underſtand them: A cloud, for inſtance, may be marked A, another cloud B, a light C, a mountain D, a terrace E, and ſo on. And having repeated theſe letters at the bottom of the paper, let him write againſt each that it is of ſuch or ſuch a colour; or for greater brevity, only *blue*, *red*, *violet*, *grey*, &c. or any other ſhorter abbreviation. After this, he muſt go to painting as ſoon as poſſible; otherwiſe moſt of what he has obſerved will, in a little time, ſlip out of his memory. This method is the more uſeful, as it not only prevents our loſing an infinity of ſudden and tranſitory beauties, but alſo helps, by means of the aforeſaid marks and characters, to perfect the other methods we have mentioned.

If it be aſked, Which is the propereſt time for theſe ſtudies? the anſwer is, That nature ſhould be ſtudied at all times, becauſe ſhe is to be repreſented at all ſeaſons; but autumn yields the moſt plentiful harveſt for her fine effects: the mildneſs of that ſeaſon, the beauty of the ſky, the richneſs of the earth, and the variety of objects, are powerful inducements with the painter to make the proper inquiries for improving his genius and perfecting his art.

But as we cannot ſee or obſerve every thing, it is very commendable to make uſe of other mens ſtudies, and to look upon them as if they were our own. Raphael ſent ſome young men into Greece to deſign ſuch things as he thought would be of ſervice to him, and accordingly made uſe of them to as good purpoſe as if he himſelf had deſigned them on the ſpot: for this, Raphael is ſo far from deſerving cenſure, that he ought, on the contrary, to be commended; as an example, that painters ought to leave no way untried for improving in their profeſſions. The landſcape painter may, accordingly, make uſe of the works of all thoſe who have excelled in any kind, in order to acquire a good manner; like the bees which gather their variety of honey from different flowers.

General Remarks on Landſcapes. As the general rules of painting are the baſis of all the ſeveral kinds of it, we muſt refer the landſcape-painter to them, or rather ſuppoſe him to be well acquainted with them. We ſhall here only make ſome general remarks on this kind of painting.

I. Landſcape ſuppoſes the knowledge and practice of the principal rules in *perſpective*, in order to maintain probability.

II. The nigher the leaves of trees are to the earth, the larger they are, and the greener; as being apteſt to receive, in abundance, the ſap which nouriſhes them: and the upper branches begin firſt to take the

Landſcapes. rednefs or yellowneſs which colours them in autumn. But it is otherwiſe in plants; for their ſtocks renew all the year round, and their leaves ſucceed one another, at a conſiderable diſtance of time, inſomuch that nature, employed in producing new leaves to adorn the ſtock as it riſes, does by degrees deſert the under ones; which, having firſt performed their office, are the firſt that die: but this effect is more viſible in ſome than in others.

III. The under parts of all leaves are of a brighter green than the upper, and almoſt always incline to the ſilveriſh; and thoſe which are wind ſhaken are known from others by that colour: but if we view them from beneath, when penetrated by the ſun's rays, they diſcover ſuch a fine and lively green as is far beyond all compariſon.

IV. There are five principal things which give ſpirit to landſcape, viz. figures, animals, waters, wind-ſhaken trees, and thinneſs of pencilling; to which add ſmoke, when there is occaſion to introduce it.

V. When one colour predominates throughout a landſcape, as one green in ſpring, or one red in autumn, the piece will look either as of one colour, or elſe as unfiniſhed. We have ſeen many of Bourdon's landſcapes, which, by handling the common one way throughout, have loſt much of their beauty, though the ſituations and waters were very pleaſant. The ingenious painter muſt endeavour to correct, and, as they ſay, redeem the harſh unſightly colouring of winter and ſpring by means of figures, waters, and buildings; for ſummer and autumn ſubjects are of themſelves capable of great variety.

VI. Titian and Carrache are the beſt models for inſpiring good taſte and leading the painter into a good track, with regard to forms and colours. He muſt uſe all his efforts to gain a juſt idea of the principles which thoſe great men have left us in their works; and to have his imagination filled with them, if he would advance by degrees towards that perfection which the artiſt ſhould have always in view.

VII. The landſcapes of theſe two maſters teach us a great many things, of which diſcourſe can give us no exact idea, nor any general principle. Which way, for example, can the meaſures of trees in general be determined, as we determine thoſe of the human body? The tree has no ſettled proportions; moſt of its beauty lies in the contraſt of its branches, an unequal diſtribution of boughs, and, in ſhort, a kind of whimſical variety, which nature delights in, and of which the painter becomes a judge when he has thoroughly reliſhed the works of the two maſters aforeſaid. But we muſt ſay, in Titian's praiſe, that the path he ſtruck out is the ſureſt; becauſe he has exactly imitated nature in its variety with an exquiſite taſte, and fine colouring: whereas Carrache, though an able artiſt, has not, more than others, been free from manner in his landſcapes.

VIII. One of the greateſt perfections of landſcape, in the variety it repreſents, is a faithful imitation of each particular character: as its greateſt fault is a licentious practice, which brings us to do things by rote.

IX. Among thoſe things which are painted practically, we ought to intermix ſome done after nature, to induce the ſpectator to believe that all are ſo.

Portraiture. X. As there are ſtyles of thought, ſo there are alſo ſtyles of execution. We have handled the two relating to thought, viz. the heroic and paſtoral; and find that there are two alſo with regard to execution, viz. the firm ſtyle, and the poliſhed; theſe two concern the pencil, and the more or leſs ingenious way of conducting it. The firm ſtyle gives life to work, and excuſe for bad choice; and the poliſhed finiſhes and brightens every thing; it leaves no employment for the ſpectator's imagination, which pleaſes itſelf in diſcovering and finiſhing things which it aſcribes to the artiſt, though in fact they proceed only from itſelf. The poliſhed ſtyle degenerates into the ſoft and dull, if not ſupported by a good opening or ſituation; but when thoſe two characters meet, the picture is fine.

SECT. III. *Of Portraiture.*

If painting be an imitation of nature, it is doubly ſo in a portrait; which not only repreſents a man in general, but ſuch a one as may be diſtinguiſhed from all others. And as the greateſt perfection of a portrait is extreme likeneſs, ſo the greateſt of its faults is to reſemble a perſon for whom it was not made; ſince there are not in the world two perſons quite like one another. But before we proceed to the particulars which let us into the knowledge of this imitation, it is neceſſary, for ſhortening this part of our ſubject, to attend to ſome general propoſitions.

I. Imitation is the eſſence of painting: and good choice is to this eſſence what the virtues are to a man; they raiſe the value of it. For this reaſon, it is extremely the painter's intereſt to chooſe none but good heads, or favourable moments for drawing them, and ſuch poſitions as may ſupply the want of a fine natural.

II. There are views of the natural more or leſs advantageous; all depends upon turning it well, and taking it in the favourable moment.

III. There is not a ſingle perſon in the world who has not a peculiar character both in body and face.

IV. Simple and genuine nature is more proper for imitation; and is a better choice than nature much formed, and embelliſhed too artificially.

V. To adorn nature too much is doing it a violence; and the [illegible] which attends it can never be free when its ornaments are not eaſy. In ſhort, in proportion as we adorn nature, we make it degenerate from itſelf, and bring it down to art.

VI. Some means are more advantageous than others to come at the ſame end.

VII. We muſt not only imitate what we do ſee in nature, but alſo what we may poſſibly ſee that is advantageous in art.

VIII. Things are valuable by compariſon; and it is only by this we are enabled to make a right judgment of them.

IX. Painters eaſily accuſtom themſelves to their own tints, and the manner of their maſters: and after this habit is rooted in them, they view nature not as ſhe really is, but as they are uſed to paint her.

X. It is very difficult to make a picture, the figures of which are as big as the life, to have its effect near as at a diſtance. A learned picture pleaſes the ignorant only when it is at ſome diſtance; but judges

Portraiture.

will admire its artifice near, and its effect at a diſtance.

XI. Knowledge makes work pleaſant and eaſy. The traveller who knows his road, comes to his journey's end with more ſpeed and certainty than he who inquires and gropes it out.

XII. It is proper, before we begin a work, to meditate upon it, and to make a nice coloured ſketch of it, for our own ſatisfaction, and a help to the memory.

We cannot too much reflect on theſe propoſitions; and it is neceſſary to be well acquainted with them, that they may preſent themſelves to our mind, of their own accord, without our being at the trouble to recal them, to our memory when we are at work.

There are four things neceſſary to make a portrait perfect; *air*, *colouring*, *attitude*, and *dreſs*.

Of Air. The air reſpects the lines of the face, the head attire, and the ſize.

The lines of the face depend upon exactneſs of draught, and agreement of the parts; which all together muſt repreſent the phyſiognomy of the perſon painted in ſuch a manner, that the picture of his body may ſeem to be alſo that of his mind.

It is not exactneſs of deſign in portraits that gives ſpirit and true air, ſo much as the agreement of the parts at the very moment when the diſpoſition and temperament of the ſitter are to be hit off. We ſee ſeveral portraits which, though correctly deſigned, have a cold, languiſhing, and ſtupid air; whilſt others, leſs correct in deſign, ſtrike us, however, at firſt ſight with the ſitter's character.

Few painters have been careful enough to put the parts well together: Sometimes the mouth is ſmiling, and the eyes are ſad; at other times, the eyes are cheerful, and the cheeks lank: by which means their work has a falſe air, and looks unnatural. We ought therefore to remember, that, when the ſitter puts on a ſmiling air, the eyes cloſe, the corners of the mouth draw up towards the noſtrils, the cheeks ſwell, and the eyebrows widen: but in a melancholy air, theſe parts have a contrary effect.

The eyebrows, being raiſed, give a grave and noble air; but if arched, an air of aſtoniſhment.

Of all the parts of the face, that which contributes moſt to likeneſs, is the noſe; it is therefore of great moment to ſet and draw it well.

Though the hair of the head ſeems to be part of the dreſs which is capable of various forms without altering the air of the face; yet the head attire which one has been moſt accuſtomed to creates ſuch a likeneſs, that we ſcarce know a familiar acquaintance on his putting on a periwig ſomewhat different from that which he uſed to wear. It is neceſſary therefore, as far as poſſible, to take the air of the head ornament, and make it accompany and ſet off that of the face, if there be no reaſon to the contrary.

As to the ſtature, it contributes ſo much to likeneſs, that we very often know people without ſeeing their face: It is therefore extremely proper to draw the ſize after the ſitter himſelf, and in ſuch an attitude as we think fit; which was Vandyke's method. Here let us remark, that, in ſitting, the perſon appears to be of a leſs free make, through the heaving of his ſhoulders; wherefore, to adjuſt his ſize, it is proper to make him ſtand for a ſmall time, ſwaying in the poſture we would give him, and then make our obſervation. But here occurs a difficulty, which we ſhall endeavour to examine: "Whether it is proper, in portraiture, to correct the defects of nature?"

Colouring.

Likeneſs being the eſſence of portraiture, it would ſeem that we ought to imitate defects as well as beauties, ſince by this means the imitation will be more complete: It would be even hard to prove the contrary to one who would undertake the defence of this poſition. But ladies and gentlemen do not much approve of thoſe painters who entertain ſuch ſentiments, and put them in practice. It is certain that ſome complaiſance in this reſpect is due to them; and there is little doubt but their pictures may be made to reſemble, without diſpleaſing them; for the effectual likeneſs is a juſt agreement of the parts that are painted with thoſe of nature; ſo that we may be at no loſs to know the air of the face, and the temper of the perſon whoſe picture is before us. All deformities, therefore, when the air and temper may be diſcovered without them, ought to be either corrected or omitted in women's and young men's portraits. A noſe ſomewhat awry may be helped, or a ſhrivelled neck or high ſhoulders adapted to a good air, without going from one extreme to another. But this muſt be done with great diſcretion: for, by endeavouring to correct nature too much, we inſenſibly fall into a method of giving a general air to all our portraits; juſt as, by confining ourſelves too much to the defects and littleneſs of nature, we are in danger of falling into the low and taſteleſs manner.

But in the faces of heroes and men of rank, diſtinguiſhed either by dignities, virtues, or great qualities, we cannot be too exact, whether the parts be beautiful or not: for portraits of ſuch perſons are to be ſtanding monuments to poſterity; in which caſe, every thing in a picture is precious that is faithful. But after whatever manner the painter acquits himſelf in this point, let him never forget good air nor grace; and that there are, in the natural, advantageous moments for hitting them off.

Of Colouring.—Colouring, in portraiture, is an effuſion of nature, diſcovering the true tempers of perſons; and the temper being eſſential to likeneſs, it ought to be handled as exactly as the deſign. This part is the more valuable, as it is rare and difficult to hit. A great many painters have come to a likeneſs by ſtrokes and outlines; but certainly they are few who have ſhown in colours the tempers of perſons.

Two points are neceſſary in colouring; exactneſs of tints, and the art of ſetting them off. The former is acquired by practice, in examining and comparing the colours we ſee in life with thoſe by which we would imitate it: and the art of thoſe tints conſiſts in knowing what one colour will produce when ſet by another, and in making good what either diſtance or time may abate of the glow and freſhneſs of the colours.

A painter who does nothing more than what he ſees, will never arrive at a perfect imitation; for though his work may ſeem, on the eaſel, to be good to him, it may not appear ſo to others, and perhaps even to himſelf, at a diſtance. A tint which, near, appears diſjoined, and of one colour, may look of another at a diſtance, and be confounded in the maſs it belongs to. If you would have your work, therefore, to produce a good

Attitude.

good effect in the place where it is to hang, both the colours and lights muſt be a little loaded; but learnedly, and with diſcretion. In this point conſult Titian, Rubens, Vandyke, and Rembrandt's method; for indeed their art is wonderful.

The tints uſually require three times of obſervation. The firſt is at the perſon's firſt ſitting down, when he has more ſpirit and colour than ordinary; and this is to be noted in the firſt hour of his ſitting. The ſecond is when, being compoſed, his look is as uſual; which is to be obſerved in the ſecond hour. And the third is when, through tireſomeneſs by ſitting in one poſture, his colour alters to what wearineſs uſually creates. On which account, it is beſt to keep to the ſitter's uſual tint, a little improved. He may alſo riſe, and take ſome turns about the room, to gain freſh ſpirits, and ſhake off or prevent tireſomeneſs.

In *draperies*, all ſorts of colours do not ſuit all ſorts of perſons. In men's portraits, we need only obſerve great truth and great force: but in women's there muſt alſo be charms; whatever beauty they have muſt appear in a fine light, and their blemiſhes muſt by ſome means or other be ſoftened. For this reaſon, a white, lively, and bright tint, ought never to be ſet off by a fine yellow, which would make it look like plaſter; but rather by colours inclining to green, blue, or gray, or ſuch others as, by the oppoſition, may make the tint appear more fleſhy than uſual in fair women. Vandyke often made a fillemot coloured curtain for his ground; but that colour is ſoft and brown. Brown women, on the other hand, who have yellow enough in their tints to ſupport the character of fleſhineſs, may very well have yellowiſh draperies, in order to bring down the yellow of their tints, and make them look the freſher; and near very high coloured and lively carnations linen does wonders.

In *grounds*, two things are obſervable; the tone and the colour. The colour is to be conſidered in the ſame manner as thoſe of draperies, with reſpect to the head. The tone muſt be always different from the maſs it ſupports, and of which it is the ground, that the objects coming upon it may not ſeem tranſparent, but ſolid and raiſed. The colour of the hair of the head uſually determines the tone of the ground; and when the former is a bright cheſnut, we are often embarraſſed, unleſs helped by means of a curtain, or ſome accident of the claro obſcuro, ſuppoſed to be behind, or unleſs the ground is a ſky.

We muſt further obſerve, that where a ground is neither curtain nor landſcape, or ſuch like, but is plain and like a wall, it ought to be very much party-coloured, with almoſt imperceptible patches or ſtains; for, beſides its being ſo in nature, the picture will look the more grand.

Of Attitude, or Poſture.—Attitudes ought to ſuit the age and qualities of perſons and their tempers. In old men and women, they ſhould be grave, majeſtic, and ſometimes bold: and generally, in women, they ought to have a noble ſimplicity and modeſt cheerfulneſs; for modeſty ought to be the character of women; a charm infinitely beyond coquetry! and indeed coquettes themſelves are not to be painted ſuch.

Attitudes are of two kinds: one in motion, the other at reſt. Thoſe at reſt may ſuit every perſon: but thoſe in motion are proper for young people only, and are hard to be expreſſed; becauſe a great part of the hair and drapery muſt be moved by the air; motion, in painting, being never better expreſſed than by ſuch agitations. The attitudes at reſt muſt not appear ſo much at reſt as to ſeem to repreſent an inactive perſon, and one who ſits for no other purpoſe but to be a copy. And though the figure that is repreſented be at reſt, yet the painter, if he thinks fit, may give it a flying drapery, provided the ſcene or ground be not a chamber or cloſe place.

Practice in Portraiture.

It is above all things neceſſary that the figures which are not employed ſhould appear to ſatisfy the ſpectator's curioſity; and for this purpoſe ſhow themſelves in ſuch an action as ſuits their tempers and conditions, as if they would inform him what they really were: and as moſt people pretend to ſincerity, honeſty, and greatneſs of mind, we muſt avoid in attitudes, all manner of affectation; every thing there muſt appear eaſy and natural, and diſcover more or leſs ſpirit, nobleneſs, and majeſty, in proportion to the perſon's character and dignity. In a word, the attitudes are the language of portraits; and the ſkilful painter ought to give great attention to them.

But the beſt attitudes are ſuch as induce the ſpectator to think that the ſitter took a favourable opportunity of being ſeen to advantage, and without affectation. There is only one thing to be obſerved with regard to women's portraits, in whatever attitude they are placed; which is, that they ſway in ſuch a manner as to give their face but little ſhade; and that we carefully examine whether the lady appear moſt beautiful in a ſmiling or in a ſerious air, and conduct ourſelves accordingly. Let us now proceed to the next article.

Of Practice in Portraiture.—According to De Piles, portraiture requires three different ſittings and operations; viz. dead colouring, ſecond colouring, and retouching or finiſhing. Before the painter dead colour, he muſt attentively conſider what aſpect will beſt ſuit the ſitter, by putting him in different poſitions, if we have not any ſettled deſign before us: and when we have determined this, it is of the laſt conſequence to put the parts well together, by comparing always one part with another; for not only the portrait acquires a greater likeneſs when well deſigned, but it is troubleſome to make alterations at the ſecond ſitting, when the artiſt muſt only think of painting, that is, of diſpoſing and uniting his colours.

Experience tells us, that the dead colouring ought to be clean, becauſe of the ſlope and tranſparency of the colours, eſpecially in the ſhades: and when the parts are well put together, and become clammy, they muſt be judiciouſly ſweetened and melted into each other; yet without taking away the air of the picture, that the painter may have the pleaſure of finiſhing it, in proportion as he draws. But if fiery geniuſes do not like this method of ſcumbling, let them only mark the parts ſlightly, and ſo far as is neceſſary for giving an air.

In dead colouring, it is proper to put in rather too little than too much hair about the forehead; that, in finiſhing, we may be at liberty to place it where we pleaſe, and to paint it with all poſſible ſoftneſs and delicacy. If, on the contrary, you ſketch upon the forehead a lock which may appear to be of a good taſte, Practice of Vandyke.

and becoming the work, you may be puzzled in finiſhing it, and not find the life exactly in the ſame poſition as you would paint it. But this obſervation is not meant for men of ſkill and conſummate experience, who have nature in their heads, and make her ſubmit to their ideas.

The buſineſs of the ſecond ſitting is, to put the colours well in their places, and to paint them in a manner that is ſuitable to the ſitter and to the effect we propoſe: But before they are made clammy, we ought to examine afreſh whether the parts are rightly placed, and here and there to give ſome touches towards likeneſs, that, when we are aſſured of it, the work may go on with greater ſatisfaction. If the painter underſtands what he is about, and the portrait be juſtly deſigned, he ought as much as poſſible to work quick; the ſitter will be better pleaſed, and the work will by this means have the more ſpirit and life. But this readineſs is only the effect of long ſtudy and experience; for we may well be allowed a conſiderable time to find out a road that is eaſy, and ſuch as we muſt often travel in.

Before we retouch or finiſh, it is proper to terminate the hair, that, on finiſhing the carnations, we may be abler to judge of the effect of the whole head.

If, at the ſecond ſitting, we cannot do all we intended, which often happens, the third makes up the loſs, and gives both ſpirit, phyſiognomy, and character.

If we would paint a portrait at once, we muſt load the colouring; but neither ſweeten, nor drive, nor very much oil it: and if we dip the pencil in varniſh as the work advances, this will readily enable us to put colour on colour, and to mix them without driving.

The uſe and ſight of good pictures give greater light into things than words can expreſs: What hits one artiſt's underſtanding and temper, may be diſagreeable to another's; and almoſt all painters have taken different ways, though their principles were often the ſame.

We are told that a friend of Vandyke's having obſerved to him how little time he beſtowed on his portraits, Vandyke anſwered, "That at firſt he worked hard, and took great pains, to acquire a reputation, and alſo to get a ſwift hand, againſt the time he ſhould work for his kitchen." Vandyke's cuſtom is ſaid to have been this: He appointed both the day and hour for the perſon's ſitting, and worked not above an hour on any portrait, either in rubbing in or finiſhing; ſo that as ſoon as his clock informed him that the hour was out, he roſe up, and made a bow to the ſitter, to ſignify, that he had done enough for that day, and then appointed another hour ſome other day; whereupon his ſervant came to clean his pencils, and brought a freſh pallet, whilſt he was receiving another ſitter, whoſe day and hour he had before appointed. By this method he worked on ſeveral pictures the ſame day, with extraordinary expedition.

After having lightly dead-coloured the face, he put the ſitter into ſome attitude which he had before contrived; and on a gray paper, with white and black crayons, he deſigned, in a quarter of an hour, his ſhape and drapery, which he diſpoſed in a grand manner, and an exquiſite taſte. After this, he gave the drawing to the ſkilful people he had about him, to paint after the ſitter's own clothes, which, at Vandyke's requeſt, were ſent to him for that purpoſe. When his diſciples had done what they could to theſe draperies, he lightly went over them again; and ſo, in a little time, by his great knowledge, diſplayed the art and truth which we at this day admire in them. As for hands, he had in his houſe people of both ſexes, whom he paid, and who ſerved as models.

Judgment of Tints.

This conduct of Vandyke, however, is mentioned rather to gratify the reader's curioſity, than to excite his imitation; he may chooſe as much of it as he pleaſes, and as ſuits his own genius, and leave the reſt.

We muſt obſerve by the way, that there is nothing ſo rare as fine hands, either in the deſign or colouring. It is therefore convenient to cultivate, if we can, a friendſhip with ſome women who will take pleaſure in ſerving for a copy: The way to win them is, to praiſe their beauty exceedingly. But if an opportunity ſerves of copying hands after Vandyke, it muſt not be let ſlip; for he drew them with a ſurpriſing delicacy, and an admirable colouring.

It is of great ſervice to copy after the manners which come neareſt to nature; as are thoſe of Titian and Vandyke. We muſt, at ſuch times, believe them to be nature itſelf; and, at ſome diſtance, conſider them as ſuch, and ſay to ourſelves—*What colour and tint ſhall I uſe for ſuch a part?* And then, coming near the picture, we ought to examine whether we are right or not; and to make a fixed rule of what we have diſcovered, and did not practiſe before without uncertainty.

It is recommended, before we begin colouring, to catch the very firſt moments, which are commonly the moſt agreeable and moſt advantageous, and to keep them in our memory for uſe when we are finiſhing: for the ſitter, growing tired with being long in the ſame place, loſes thoſe ſpirits, which, at his firſt ſitting down, gave beauty to the parts, and conveyed to the tint more lively blood, and a freſher colour. In ſhort, we muſt join to truth a probable and advantageous poſſibility, which, far from abating likeneſs, ſerves rather to ſet it off. For this end, we ought to begin with obſerving the ground of a tint, as well what it is in lights as in ſhadings; for the ſhades are only beautiful as they are proportioned to the light. We muſt obſerve, if the tint be very lively, whether it partakes of yellowneſs, and where that yellowneſs is placed; becauſe uſually, towards the end of the ſitting, fatigue diffuſes a general yellowneſs, which makes us forget what parts were of this colour, and what were not, unleſs we had taken due notice of it before. For this reaſon, at the ſecond ſitting, the colours muſt be everywhere readily clapped in, and ſuch as appear at the firſt ſitting down; for theſe are always the fineſt.

The ſureſt way to judge of colours is by compariſon; and to know a tint, nothing is better than to compare it with linen placed next it, or elſe placed next to the natural object, if there is occaſion.—We ſay this only to thoſe who have little practiſed nature.

The portrait being now ſuppoſed to be as much finiſhed

Different Methods of Painting.

finiſhed as you are able, nothing remains, but, at ſome reaſonable diſtance, to view both the picture and ſitter together, in order to determine with certainty, whether there is any thing ſtill wanting to perfect the work.

Sect. IV. *Of Theatrical Decorations; the Deſigns for Furniture, Embroidery, Carriages, &c.*

Of Theatrical Decorations.—This is a particular art which unites ſeveral of the general parts of painting with the knowledge of architecture, perſpective, &c. They who apply themſelves to it would do well to deſign their decorations by day, and to colour them by candle light, as they will be much better able to judge of the effect of a painting intended to be viewed by that light. It is proper alſo to caution the young painter to avoid, as much as poſſible, the uniting the imitations of nature with nature itſelf; that is, he ſhould not introduce with his decorations living horſes, or other animals, real fountains or caſcades, trees, or ſtatues, &c. For ſuch combinations are the effect of ignorance and a bad taſte; they are the reſource of painters of little ability; they diſcover a ſterility of invention, and produce great inconvenience in the repreſentation. Thoſe pieces which they call moving pictures, where the painted landſcape remains immoveable, and the figures move by means of ſprings, form a part of theſe decorations; and there are ſome of them, as thoſe of Antwerp and Ghent, that have a pleaſing effect.

The deſigns for *furniture, carriages, porcelain*, and other branches of manufacture, form alſo a very important article of painting in general, and of academy painting in particular. This is a diſtinct branch of the art; and without doubt not the leaſt uſeful of its parts, as it concurs ſo eſſentially to the ſucceſs of manufactures, and conſequently to the proſperity of a ſtate: and it is an art, to which it were much to be wiſhed that youth of ability and invention would apply themſelves. See the articles Japanning and Porcelain.

Sect. V. *Enumeration of the different Methods of Painting, or the different Means and Materials that Painters make uſe of to imitate all viſible Objects on a plane Superficies.*

Those now in practice are,

1. Painting in oil; which is preferable to all other methods, as it is more ſuſceptible of all ſorts of expreſſions, of more perfect gradations of colours, and is at the ſame time more durable.

2. Mosaic painting; an invention truly wonderful; it is compoſed of a great number of ſmall pieces of marble of different colours, joined together with ſtucco. The works of this kind are made principally at Rome, where this art has been carried ſo far as to reſemble the paintings of the greateſt maſters; and of theſe are made monuments for the lateſt poſterity.

3. Painting in fresco; which is by drawing, with colours diluted with water, on a wall newly plaſtered, and with which they ſo incorporate, that they periſh only with the ſtucco itſelf. This is principally uſed on ceilings.

Fresco.

4. Painting in water colours; that is, with colours mixed with water and gum, or paſte, &c.

5. Miniature painting; which differs from the preceding as it repreſents objects in the leaſt diſcernible magnitudes.

6. Painting in crayons; for which purpoſe colours, either ſimple or compound, are mixed with gum, and made into a kind of hard paſte like chalk, and with which they draw on paper or parchment.

7. Painting in enamel; which is done on copper or gold, with mineral colours that are dried by fire, and become very durable. The paintings on the porcelain of China and Europe, on Delft ware, &c. are ſo many ſorts of enamel.

8. Painting in wax, or encaustic painting: This is a new, or rather an old invention renewed, in which there are in France performances highly pleaſing. It is done with wax mixed with varniſh and colours.

9. Painting on glass; of which there are various kinds.

See all the articles here enumerated, explained in the order of the alphabet. On one of them, however, ſome additional obſervations may here be ſubjoined.

§ 1. *Of Painting in Freſco.*

Of all kinds of painting freſco is the moſt ancient, the moſt durable, the moſt ſpeedily executed, and the moſt proper to adorn great buildings. It appears, that the fragments of ancient painting handed down to us by the Romans are all in freſco. Norden, quoted by Winkleman, ſpeaks of the ruins of Egyptian palaces and temples, in which are coloſſal paintings on walls 80 feet high. The deſcription which thoſe authors have given of theſe paintings, of the prepared ground, and of the manner in which the colours have been employed, &c. ſhows plainly that they have been executed in freſco.

The ſtability of freſco is demonſtrated by the exiſtence of thoſe fragments of the higheſt antiquity. There are no other kinds of painting which could equally have reſiſted the injuries of the weather, the exceſſive aridity of certain climates, the moiſture of ſubterraneous ſituations, and the encroachments of barbarians.

There are different opinions concerning the climate moſt proper to preſerve this kind of painting. "It is obſerved (ſays Felibien), that the colours in *freſco* fade ſooner in Italy and Languedoc than at Paris; perhaps from leſs heat in the laſt mentioned place, or better lime." M. Falconet contradicts this aſſertion in his notes on Pliny, Vol. I. p. 223. of his miſcellaneous works, publiſhed at Paris 1787. Painting in freſco, according to this author, is longer preſerved in dry and warm, than in northern and moiſt climates. However oppoſite the ſentiments of theſe two authors may appear to be, it is poſſible to reconcile them, when we conſider, that the expoſure to a burning ſun is capable of operating a great change of the colours on the one hand, and that the froſt in a cold climate inevitably deſtroys the paintings of freſco on the other. Froſt is capable of burſting ſtones, of corroding the petrified veins of earth in the heart of coloured marble, and in ſhort, nothing can reſiſt its deſtructive operation.

Theſe obſervations on freſco paintings lead us to conclude, that the choice of place, when they are without doors, is of the greateſt importance. In countries where there is little or no froſt, an expoſure to the north is the moſt favourable; and in cold climates a weſtern expoſure ſhould be made choice of, becauſe the firſt rays of the riſing ſun have a very pernicious effect after froſt. We are not, however, wholly to adopt the ſentiment of M. Falconet with regard to the pernicious effects of moiſture on freſco paintings: for, 1. The ancient paintings recovered from moiſt places, in which they were buried for many ages, have, under enormous heaps of earth, preſerved all their colours. Thoſe from the ruins of Herculaneum have been obſerved, on the contrary, to loſe their colours in a ſhort time after they have been dried by the exterior air. 2. The mortar which compoſes the ground of this painting is not deſtroyed in our rainy climates. It is neceſſary frequently to uſe powder in removing pieces of this mortar, which are now found to obſtruct ſome buildings in Paris.

After the choice of place, the choice of materials is the next thing of importance in executing freſco. To make it durable, the ground is the object of chief attention; and to make this perfect, the mortar uſed by the ancients, now unknown, would be neceſſary.

It is eaſy to perceive, that a minute detail of forms, an extenſive mixture and gradation of tints, and the merit of a delicate and gentle touch, can make no part of the excellencies of this kind of painting. It cannot bear a cloſe examination like a picture in oil. There is always ſomething dry and rough which diſpleaſes. An artiſt who would flatter himſelf with ſucceſs in a freſco placed near the eye would be groſsly deceived: a common ſpectator would find it coarſe and badly finiſhed.

Freſco is chiefly employed in palaces, temples, and public edifices. In theſe vaſt places no kind of painting can be preferred to it; large, vivid in its ſtrokes, and conſtantly freſh, it enriches the architecture, animates it, and gives relief to the eye from the repetition of the ſame forms, and the monotony of colour in a place where coloured marbles and bronzes are not employed. Still more a fine freſco gives the greateſt effect to a lofty building, ſince this building ſerves as a frame and ſupport to this enchanting art, which fixes the attention of every perſon of ſenſibility and taſte.

We ſhall afterwards have occaſion to ſhow the manner of executing freſco, as well as the nature and application of the colours employed in it: it is neceſſary to demonſtrate here, that it has a freſhneſs, ſplendour, and vigour not to be found in oil or water colours.

A known principle in all kind of painting is, that the colouring is more perfect in proportion as it approaches to the lights and ſhades in nature. As colours applied to any ſubject can never reach this degree of perfection, the alluſion which painters produce conſiſts in the compariſon and oppoſition of the tones of colours among themſelves.

If the white of the fineſt and pureſt oil appears heavy and gray, compared with great lights in natural whites, it follows, that, in order to copy them with fidelity, the tones which follow the firſt white muſt be degraded in an exact proportion. Thus it is neceſſary that the ſhades of a picture be conſiderably deeper than thoſe of the model; eſpecially if, from the greateſt lights to the browns, one hath proportionally followed the diſtance which is found between the colours on the pallet and the tones of the object copied.

Now if the white of freſco be infinitely more bright than that of oil, the ſame effect will be obtained in a brown tone. On the other ſide, if it conſtantly happens that the brown tones of freſco are much more vigorous than thoſe of water colours, and equal even to the browns of oil itſelf, it is certain that it poſſeſſes a ſplendour and vigour more extenſive than any other kind of painting. Thus in the hands of an artiſt who is well acquainted with the colours fit for freſco, it is more ſuſceptible of the general effect, and more capable than any other kind of giving projection and the ſemblance of life to the figures.

If we were to inquire why painting in freſco is now ſcarcely or never practiſed, we ſhould perhaps aſcribe it to the great talents required to execute it. "Many of our painters (ſays Vaſari in his Treatiſe on Painting) excel in oil or water colours, and yet fail in freſco; becauſe of all kinds this requires the greateſt ſtrength of genius, boldneſs in the ſtrokes, and reſolution." If in an age abounding in great maſters, it was difficult to excel in this kind, it muſt be much more ſo in ours; but we ſhould not require the characters of ſublimity and ſtyle to which men were accuſtomed in the time of Vaſari.

We ſhould execute in freſco as we do in oils; for Italy herſelf, along with Michael Angelo and Zuicharo, had Cortonni Giardano and Franciſchini as middling freſco painters. And in France, Lafoſſe, Bon-Boulogne, and Perur, performed ſeveral works in freſco which might be imitated by the painters of our times. But let us proceed to the real cauſes for abandoning this art. Theſe proceed from the want of knowledge and taſte in the perſons who employ the artiſts, and from the manners of the age. As a pleaſant or licentious conceit, unfiniſhed colouring, and bold effects of ſhade, are the chief objects of conſideration, a very ſmooth painting enlivened by gentle touches completely gratifies the perſon who pays the price; and therefore the philoſophical principles of the art, which require ſtudy, are not cultivated.

We ſhall now attend to the mechanical proceſs of this uſeful and beautiful kind of painting. Before painting, it is neceſſary to apply two layers. If the wall on which you are to paint is of brick, the layer is eaſily applied; but if it is of free ſtone cloſely united, it is neceſſary to make excavations in the ſtone, and to drive into them nails or pegs of wood in order to hold the firſt layer.

The firſt layer is made of good lime and a cement of pounded brick, or, which is ſtill better, river ſand: this latter forms a layer more uneven, and better fitted to retain the ſecond ſmooth and poliſhed layer applied to its ſurface.

There ſhould be experiments to diſcover a layer ſtill more compact, and more independent of the variations of the air; ſuch for example, as covers the aqueducts and ancient reſervoirs conſtructed by the Romans in the neighbourhood of Naples.

Before applying the ſecond layer, or what you are to paint, it is neceſſary that the firſt be perfectly dry; for there iſſues from the lime, when it is moiſt, a ſmell both diſagreeable and pernicious to the artiſt.

When

Freſco. when the firſt layer is perfectly dry, it is wet with water in proportion to its dryneſs, that the ſecond layer may the more eaſily incorporate with it.

The ſecond layer is compoſed of lime, ſlaked in the air, and expoſed for a year, and of river ſand, of an equal grain, and moderately fine.

It requires an active and intelligent maſon to apply this layer, as the ſurface muſt be altogether equal. The operation is performed with a trowel; and the operator requires to have a ſmall piece of wood to take away the large grains of ſand, which, remaining, might render the ſurface uneven.

To give a fine poliſh to this layer, one ought to take a ſheet of paper, apply it to the wall, and paſs and repaſs the trowel over the paper. By this means the little inequalities which hurt the exactneſs of the ſtroke, and which produce falſe appearances at a diſtance, are entirely ſmoothed.

The maſon muſt not lay more than the painter can finiſh in a day, as this kind of painting muſt be executed on a freſh ground.

The layer being thus prepared, the painter begins his operation; but as painting in freſco muſt be executed rapidly, and as there is no time to retouch any of the ſtrokes, the painter, as we have obſerved under the article FRESCO, takes care to provide himſelf with large cartoons, on which he has drawn, with exactneſs, and in their full ſize, the figures which he is to paint, which leaves him nothing to do but to copy them on the wall.

The cartoons are compoſed of ſeveral ſheets of large paper paſted one on another, neither too thick nor too ſlender.

The painter traces the tracks of the figures on the plaſter, by paſſing a ſteel point over the tracks in the cartoons, or in pricking them.

Having in this manner attained an exact and ſpeedy drawing, it now remains to execute the painting.

But it is eſſential, when one wiſhes to finiſh any ſmall work of this kind, in the firſt place to be informed of the proper colours, and of thoſe which cannot be uſed.

In general, the colours which are extracted from earths, and thoſe which have paſſed through the fire, are the only ones which can be employed in this kind of painting.

The colours are white, made of lime, the white of egg ſhells, ultramarine, the black of charcoal, yellow ochre, burnt vitriol, red earth, green of Verona, Venetian black, and burnt ochre.

There are others which require to be uſed with great precaution, ſuch as enamel blue, cinnabar, and white marble duſt.

When enamel blue is uſed, it requires to be applied inſtantaneouſly, and when the lime is very moiſt, otherwiſe it does not incorporate with the plaſter; and if one retouch with this colour, it muſt be done an hour or more after the firſt application, to increaſe its luſtre.

With regard to the white marble duſt, it is ſubject to turn black if it be not mixed up with a convenient quantity of white lime.

Cinnabar which has a ſplendour almoſt ſuperior to all other colours, loſes it almoſt entirely when mixed with lime. At the ſame time, it may be employed in places not expoſed to the air, with a little degree of care in the preparation. Reduce a quantity of the pureſt cinnabar to powder, put it into an earthen veſſel, and pour lime water on it for two or three times. By this proceſs the cinnabar receives ſome impreſſion of lime water, which makes it capable of being employed in freſco painting.

Elydoric Painting. One of the beſt colours, and the one moſt uſed in freſco for the gradation of tints, and for giving the requiſite tone, is white of lime. This white is prepared by mixing lime ſlaked long before with good water. The lime depoſites a ſediment at the bottom of the veſſel; when the water is poured off, this ſediment is the white of lime.

Another kind of white might be uſed, the effects of which would be known by experience, namely, the white of egg ſhells. To prepare this white, one muſt take a great quantity of ſhells of eggs, which muſt be pounded and boiled in water along with a quantity of quicklime; after this they are put into a ſtrainer, and waſhed repeatedly with fountain water.

The ſhells are again pounded until the water employed for that purpoſe become pure and limpid; and when they are in this manner reduced to powder, this powder is grinded in water, and formed into ſmall pieces, and dried in the ſun.

All the different kinds of ochres make excellent colours for freſco, and take different ſhades, being previouſly burned in iron cheſts.

With regard to the Naples yellow, it is dangerous to uſe it where the painting is much expoſed to the air. The blacks of charcoal, of peach ſtones, and of vine twigs, are good: but that extracted from bones is of no value.

Roman vitriol gathered at the furnaces, and which is called *burnt vitriol*, grinded afterwards in ſpirit of wine, reſiſts the air extremely well when employed in lime. There is alſo a red extracted from this preparation ſomewhat like that produced from lac.

This colour is very proper for preparing the layers to be coloured with cinnabar; and the draperies painted with theſe two colours will vie in ſplendour with thoſe painted with fine lac in oil.

The ultramarine is the moſt faithful colour; and it not only never changes, but it communicates this precious quality to thoſe colours with which it is mixed.

The manner of employing thoſe colours, is to grind them in water, and to begin by arranging them into the principal tints you are to employ: theſe are afterwards put into pots; and it is neceſſary to uſe a great many pallets raiſed at the edges, to form the intermediate ſhades, and to have under your eye all the ſhades you require.

As all the tints, except burnt ochre, violet, red, and blacks of all kinds, are apt to become clear, the painter muſt have beſide him ſome pieces of brick or new tile very dry. A daſh of the colours is applied to one of theſe with the pencil before uſing them; and as tile inſtantaneouſly imbibes the water, one perceives what the ſhade will be after the freſco is dry.

§ 2. *Elydoric Painting, invented by M. Vincent of Montpetit.*

THIS new kind of painting is little known, and capable of great improvement.

Its principal advantages are, that the artiſt is able to give the greateſt finiſhing poſſible to ſmall figures in oil; to add to the mellowneſs of oil painting, the greateſt beauty of water colours in miniature, and to do it in ſuch a manner that it appears like a large picture ſeen through a glaſs which diminiſhes objects.

This kind of painting takes its name from two Greek words expreſſive of *oil* and *water*; becauſe theſe two liquids are employed in the execution. The following is the manner of proceeding: A piece of very fine linen, or of white taffety, is fixed with ſtarch, in the moſt equal manner poſſible, on pieces of glaſs about two inches ſquare, the angles of which are blunted in order that the cloth may cover them neatly and without wrinkles.

When theſe pieces of cloth are ſufficiently dry, a layer compoſed of white lead finely grinded, and oil of pinks or of poppies, the whiteſt that can be found, is applied to them with a knife. When this layer is dry enough to admit of ſcraping, more may be applied if neceſſary.

As it is of the greateſt importance for the preſervation of this kind of painting, that the different layers be purged of oil, in order that they may imbibe the colours applied to them, it is neceſſary that their furface be very ſmooth, very dry, and very hard.

The artiſt is next provided with a circle of copper nearly two inches in diameter, one-fourth of an inch in height, extremely thin, and painted on the inſide with black. This circle is employed to contain the water on the ſurface of the picture.

The preference is given to water diſtilled from rain or ſnow; becauſe ordinary water, from the ſalts which it contains, is pernicious to this kind of painting.

It is neceſſary alſo to obſerve, that the colours muſt be grinded between two oriental agates, moſt carefully preſerved from duſt, and mixed with oil of poppies, or any other ſiccative oil which has been extracted without fire, and pure as water.

All the colours being grinded, they are placed in a ſmall heap on a piece of glaſs, which is covered with diſtilled water in a tin box.

When the materials are thus prepared, the ſubject is ſlightly traced on one of the pieces of cloth abovementioned with a lead pencil.

The tints are formed on the pallets from the heaps of colours under the water, and the pallet placed as uſual on the left arm with the thumb through the aperture.

The picture is held between the thumb and fore finger, ſupported by the middle, and the neceſſary pencils between the third and little fingers. The hand is ſupported on the back of a chair, that there may be full liberty of bringing the work near, or keeping it at a diſtance from the eye.

The pencils are cleaned with the eſſence of rectified turpentine.

After having made the rough draught with the colours ſtill freſh, the circle of copper, which ought to ſurround the picture, is fitted exactly to the ſurface.

The diſtilled water is poured within the circle to the height of one-eighth part of an inch; and the body is leaned forward till the ſight fall perpendicularly on the object.

The third finger of the right hand muſt reſt on the internal right angle of the picture.

The artiſt, with a fine and firm pencil, runs over the firſt draught, to give colours to the weak places, and to ſoften thoſe which appear too ſtrong.

As ſoon as the oil ſwims on the top, the water is poured off, and the picture is carefully covered with a watch glaſs, and dried in a box with a gentle heat.

When it is ſufficiently dry, to be ſcraped almoſt to a level with the knife: the above operation is renewed till the artiſt is ſatisfied with his work.

It is in this laſt work that the artiſt feels all the advantage of this new method for finiſhing.

The water poured on the picture diſcovers all the faults of the pencil, gives facility in ſearching into the bottom of the ſhades, and the power of correcting the work and of rendering it perfect.

When the work is finiſhed, it is put under a cryſtal, where there is no admiſſion of external air, and dried with a gentle heat.

PART III. OF ECONOMICAL PAINTING.

SECTION I.

THE object of this Part is to give an account of ſome mechanical proceedings in certain kinds of painting, calculated to preſerve and embelliſh the walls of houſes and furniture. This branch of the art extends to every part of architecture. The whole building becomes the workſhop of the artiſt; the ſtairs, the balluſtrades, the ſaſhes, the doors, and the railing of all kinds, occupying his firſt care, and then the ceiling and wainſcotting.

The artiſt gives to all his ſubjects a choſen and uniform tint; but he has it in his power to vary the colours on different parts of the building in ſuch a manner as to produce the moſt pleaſing effects.

22
Of the utenſils for this kind of painting.

Among the utenſils of the painter, it is needleſs, but for rendering the article complete, to mention bruſhes and pencils of all ſizes as abſolutely neceſſary.

The bruſhes are made of boars briſtles, or of hair with a mixture of briſtles; they ought to be ſtraight, very ſmooth, and of a round form. Half an hour before they are uſed, it is proper to ſoak them in water, in order to ſwell the wood of the handle, and prevent the hairs from falling off; after this they may be applied to all purpoſes, either in water colours or in oil; but it may be obſerved, that for the former they require leſs ſoftening.

The pencils are made of badgers hair, or any fine hairs enchaſed in the pipes of quills of all ſizes.

The veſſel wherein the pencils are cleaned is made of copper or of tin, ſmooth below, rounded at the ends, and divided into two parts by a thin plate in the middle. The oil, or the ſubſtance with which the pencil is cleaned, is contained in one of the diviſions.

The pallet is made of the wood of the pear or apple tree, of an oval or ſquare ſhape, very ſlender, but ſometimes ſomewhat thicker at the centre than at the extremities. A hole is made in one of its ſides ſufficiently large to admit the thumb of the workman.

When the pallet is new, it is covered with oil of walnuts; and as often as it dries, the operation is repeated, till it be fully impregnated; it is afterwards poliſhed, and finally rubbed with a piece of linen dipped in oil of common nuts.

The painter's knife is a thin flexible plate, equally ſlender on both ſides, rounded at one extremity, and the other fixed into a handle of wood.

All the veſſels employed to hold the colours ſhould be varniſhed; a precaution neceſſary to prevent their drying too quickly.

23
Of grinding and diluting the colours.

To grind, is to reduce to powder the ſubſtances which give colours on a piece of marble or any hard ſtone by means of water, oil, or eſſence.

To dilute, is to impregnate a liquid with a tint in ſuch a manner as to make it capable of being applied by a bruſh.

When the materials are grinded in water, it is proper to dilute them in ſize made from parchment. If they are diluted in ſpirit of wine, there muſt be no more diluted than what ſerves the immediate occaſion, as colours prepared in this manner dry very rapidly.

Colours grinded in oil are ſometimes diluted with pure oil, more frequently with oil mixed with eſſence, and commonly with the pure eſſence of turpentine; the eſſence makes the colours eaſy to work. Thoſe prepared in this manner are more ſolid, but they require more time to dry.

When colours are grinded with the eſſence of turpentine, and diluted in varniſh, as they require to be immediately applied, it is neceſſary to prepare a ſmall quantity at a time. This preparation of colours gives greater brilliancy, and dries more ſpeedily, than thoſe prepared in oil; but they require more art to manage them.

They grind colours or coloured ſubſtances with a mullet, which is employed on the ſtone till they become a very fine powder. The operation is facilitated by moiſtening them from time to time with a little water, and by collecting them under the mullet with the knife. They are afterwards laid in ſmall heaps on a ſheet of white paper, and allowed to dry in a ſituation not expoſed to duſt. Thoſe who grind white lead have a ſtone for the purpoſe, as this colour is very eaſily tarniſhed. In executing this part well, it is neceſſary to grind the colours equally and moderately; to grind them ſeparately, and not to produ[illegible] tint by mixture till the colours are well prepared.

Dilute no more at a time than what you have occaſion to employ, to prevent them from growing thick.

In grinding the colours, put in no more liquid than what is neceſſary to make the ſolid ſubſtances yield eaſily to the mullet; the more the colours are grinded, they mix better, and give a ſmoother and more agreeable painting.

It is alſo neceſſary to give all attention to the grinding and diluting of colours, that they may be neither too thick nor too thin.

SECT. II. *Application of Colours.*

1. PREPARE only the quantity neceſſary for the work you undertake, becauſe they do not keep long; and thoſe which are newly mixed are more vivid and beautiful.

2. Hold the bruſh ſtraight before you, and allow only the ſurface to be applied to the ſubject: if you hold it inclined in any other direction, you will run the hazard of painting unequally.

3. It is neceſſary to lay on the colours boldly, and with great ſtrokes; taking care at the ſame time to ſpread them equally over the ſurface, and not filling up the moulding and carved work. If this accident ſhould happen, you muſt have a little bruſh to clean out the colours.

4. Stir them frequently in the veſſel, that they may preſerve always the ſame tint, and that no ſediment may remain at the bottom.

5. Take care not to overcharge the bruſh with the colour.

6. Never apply a ſecond layer till the firſt or preceding one be perfectly dry; which it is eaſily known to be when, in bearing the hand gently over it, it does not adhere.

7. In order to render this drying more ſpeedy and uniform, make always the layers as thin as poſſible.

8. Before painting, it is neceſſary to prime the ſubject; that is, to give it a layer of ſize, or of white colouring oil, to fill up the pores, and render the ſurface ſmooth: by this means fewer layers of colour or of varniſh are afterwards neceſſary.

9. Every ſubject to be painted or gilded ought to have firſt a white ground; this preſerves the colours freſh and vivid, and repairs the damage which they occaſionally receive from the air.

§ 1. *Of Painting in Water Colours.*

To paint in water colours, is to do it in thoſe which are grinded in water and diluted in ſize. There are three kinds of this painting; namely *common*, the *varniſhed*, and that which is called *king's white*; but before entering on theſe, it is neceſſary to make ſome preliminary obſervations.

1. Take care that there be no greaſe on the ſubject; and if there be, ſcrape it off, or clean it with a lye, or rub the greaſy part with garlic and wormwood.

2. Let the diluted colour fall in threads from the end of the bruſh when you take it out of the veſſel; if it adheres to it, it is a proof that it wants ſize.

3. Let all the layers, eſpecially at the beginning, be laid on very warm, provided that the liquid be not boiling, which would effectually ſpoil the ſubject; and if on wood, expoſe it to crack. The laſt layer, given immediately before the varniſh, is the only one which ought to be applied cold.

4. In very fine work, where it is neceſſary to have beautiful and ſolid colours, the ſubjects are prepared by ſize and proper whites, which ſerve as a ground to receive the colour, and render the ſurface very equal and ſmooth.

5. Whatever colour is to be laid on, the white ground is the beſt, as it aſſimilates moſt eaſily with the painting, which borrows always ſomething of the ground.

6. If knots of wood are found in the ſubject, it is neceſſary to rub them with garlic, to make the ſize adhere.

To make the following details ſufficiently plain, we ſhall take the meaſures to which the quantity of colours are applied at fathoms; that is to ſay, ſix feet in height by ſix feet in breadth. We ſhall afterwards fix the quantity of materials, and of liquids, neceſſary to cover this ſurface. This, however, cannot be exactly defined; as ſome ſubjects imbibe the colours much more than others. The manner of employing them alſo makes a difference; as habit enables one to manage them to greater advantage than another. And it is alſo to be obſerved, that the firſt layer will conſume more than the ſecond; and that a prepared ſubject requires leſs than one which has not been ſo.

When we ſpeak of a fathom, it muſt be underſtood of a ſmooth and equal ſurface; for if the wood is varied with mouldings and carving, there muſt be a difference in the quantity of colours. In general it requires about a pound of colours to paint a ſquare fathom in water colours. In making up this quantity, take three-fourths of colours grinded in water, and one-fourth pound, or ſix ounces, of ſize to dilute it.

§ 2. *Of Painting in Common Water Colours.*

Works which require no great care or preparation, as cielings and ſtaircaſes, are generally painted in common water colours, *i. e.* with earths infuſed in water and diluted in ſize.

For a common white kind of this painting, ſteep Spaniſh white moderately pounded in water for two hours. Infuſe a proper quantity of the black of charcoal in water for the ſame ſpace of time; mix the black and white in the proportion that the tint requires; afterwards mix them up with a pretty ſtrong ſize, ſufficiently thick and warm, and apply them to the ſubject in as many layers as may be thought neceſſary. It requires about two pounds of white in a pint of water, and a quantity of black in proportion to the tint, together with a part of ſize, to cover a ſquare fathom. If this be employed on old walls, they muſt be well ſcraped, the duſt bruſhed off with a hair beſom, and waſhed carefully with lime water. If on new plaſter, the colours require more ſize.

All kinds of colours may be grinded in water only when the tint is made; and when they have been infuſed in water, they muſt be mixed up with ſize.

§ 3. *Walls done with the White* Des Carmes.

The white *des carmes* is a manner of whitening interior walls, whereby they are rendered extremely beautiful.

1. Procure a quantity of the very beſt lime, and paſs it through fine linen; pour it into a large tub, furniſhed with a ſpigot at the height equal to that which the lime occupies: fill the tub with clear fountain water; beat the mixture with great pieces of wood, and then allow it to ſettle for 24 hours.

2. Open the ſpigot, allow the water to run off, ſupply the tub with freſh water, and continue this operation for ſeveral days until the lime receives the greateſt degree of whiteneſs.

3. When you allow the water finally to run off, the lime will be found in the conſiſtency of paſte; but with the quantity you uſe it is neceſſary to mix a little Pruſſian blue or indigo to relieve the brightneſs of the white, and a ſmall quantity of turpentine to give it brilliancy. The ſize proper for it is made of glove leather, with the addition of ſome alum; and the whole is applied with a ſtrong bruſh in five or ſix layers to new plaſter.

4. The wall is ſtrongly rubbed over with a bruſh of hogs briſtles after the painting is dry; which gives it its luſtre and value, and which makes it appear like marble or ſtucco.

§ 4. *Of Badegeon.*

Badegeon is a pale yellow colour applied to plaſter to make it appear like free ſtones. It gives to old houſes and churches the exterior of a new building, by aſſuming the colour of ſtones newly cut.

1. Take a quantity of lime newly killed.

2. Add to it half the quantity of what the French call *ſciure de pierre*, in which you have mixed of the ochre of *rue*, according to the colour of the ſtone you intend to imitate.

3. Steep the whole in a pale of water, in which is melted a pound of rock alum. When the *ſciure de pierre* cannot be obtained, it is neceſſary to uſe a greater quantity of ochre *de rue*, or of yellow ochre, or grind the ſcales of the ſtone de St Leu; paſs it through a ſieve: and along with the lime it will form a cement, on which the weather will ſcarcely make any impreſſion.

§ 5. *Of Cielings and the Roofs of Rooms.*

When the cielings or roofs are new, and you wiſh to whiten them, take white of Bougival, to which add a little of the black of charcoal to prevent the white from growing reddiſh: infuſe them ſeparately in water; mix the whole with half water and half ſize of glove leather, which being ſtrong would make the layer come off in rolls if it were not reduced with water. Give two layers of this tint while it is lukewarm.

If the roof has been formerly whitened, it is neceſſary to ſcrape to the quick all the remaining white; then give it two or three layers of lime to ground and whiten it: Bruſh it carefully over; and give it two or three layers of the white of Bougival prepared as before.

§ 6. *Of Colouring the backs of Chimneys with Lead Ore.*

Clean them with a very ſtrong bruſh, and carefully rub off the duſt and ruſt; pound about a quarter of a pound of lead ore into a fine powder, and put it into a veſſel with half a pint of vinegar; then apply it to the back of the chimney with a bruſh: When it is made black with this liquid, take a dry bruſh, dip it in the ſame powder without vinegar, and dry and rub it with this bruſh till it become ſhining as glaſs.

§ 7. *Of Varniſhed Water Colours.*

The advantages of this kind of painting are, that the colours do not fade; that they reflect the light; that they give no offenſive ſmell, but permit the places to be inhabited as ſoon as finiſhed; and that the varniſh preſerves the wood from inſects and moiſture.

To make a fine varniſh on water colours, ſeven principal operations are neceſſary; namely, to ſize the wood, to prepare the white, to ſoften and rub the ſubject, to clean the moulding, to paint, to ſize, and to varniſh.

To ſize the wood is to give one or two layers of ſize to the ſubject which you intend to paint.

24 First operation.

Take three heads of garlic and a handful of wormwood leaves; boil them in three pints of water till they are reduced to one; paſs the juice through a linen cloth, and mix it with a pint of parchment ſize; add half a handful of ſalt and half a pint of vinegar; and boil the whole on the fire.

Size the wood with this boiling liquor; allow it to penetrate into the carved and ſmooth places of the wood, but take care at the ſame time to take it as clean off the work as poſſible, or at leaſt to leave it at no place thicker than another. This firſt ſizing ſerves to fill up the pores of the wood, and to prevent the materials afterwards from collecting in a body, which would cauſe the work to fall off in ſcales.

In a pint of ſtrong parchment ſize, to which you have added four pints of warm water, put two handfuls of white Bougival, and allow it to infuſe for the ſpace of half an hour.

Stir it well, and give a ſingle layer of it to the ſubject very warm but not boiling, equally and regularly laid on, and daſhed with repeated ſtrokes of the bruſh into the mouldings and carved work.

25 Second operation.

To prepare the white, take a quantity of ſtrong parchment ſize, and ſprinkle lightly over it with the hand, Bougival white, till the ſize be covered with it about half an inch in thickneſs; allow it to ſoak for half an hour as near the fire as to keep it milk warm: and then ſtir it with the bruſh till the lumps are broken and it be ſufficiently mixed.

Give ſeven, eight, or ten layers of this white, or as many as the nature of the work or the defects in the wood ſhall render neceſſary, giving more white to the parts which require to be ſoftened; but in general, the layers muſt be equal both with regard to the quantity of the white and the ſtrength of the ſize.

The laſt layer of the white ought to be clearer than the reſt, which is made by adding water. It muſt be applied more ſlightly, taking care with ſmall bruſhes to cover all the difficult places in the mouldings and carved work. It is neceſſary alſo, between the drying of the different layers, to fill up all the defects with white maſtich and ſize.

26 Third operation.

To ſoften, is to give to the ſubject after the whitening a ſmooth and equal ſurface, and to rub it over with a pumice ſtone.

The wood being dry, take little pieces of white wood and of pumice ſtone, grinded for the purpoſe into all neceſſary forms, either for the panels or the moulding.

Take cold water, heat being deſtructive of this kind of work; in ſummer it is common to add a little ice. Soften the wall with a bruſh, but only as much at a time as you can eaſily work, as the water might dilute the white and ſpoil the whole: Then ſmooth and rub it with the pumice ſtones and with the ſmall pieces of wood. Waſh it with a bruſh as you ſmooth it, and rub it over with a piece of new linen, which gives a fine luſtre to the work.

27 Fourth operation.

The mouldings and carved work are cleaned with an iron; and the only thing to be attended to in the operation is not to raiſe the grain of the wood.

The ſubject thus prepared is ready to receive the colour you intend to give it. Chooſe your tint; ſuppoſe a ſilver colour.

28 Fifth operation.

Grind white ceruſe and Bougival white ſeparately in water, of each an equal quantity, and mix them together.—Add a little blue of indigo and a very ſmall quantity of black of charcoal from the vine tree very fine, grinded alſo ſeparately, and in water; more or leſs of the one or other gives the tint you require.—Dilute this tint in ſtrong parchment ſize; paſs it through a bolting cloth of ſilk very fine, and lay the tint on your work, taking care to ſpread it very equally; and then give it two layers, and the colour is applied.

29 Sixth operation.

Make a weak, beautiful, and clean ſize; ſtir it till it cools; ſtrain it through a fine cloth, and give two layers to the work with a ſoft painting bruſh, which has been uſed, but which you have been careful to clean. Take care not to choke up the mouldings nor to lay on the ſize thicker on one place than another, and ſpread it over the work very ſlightly, otherwiſe you will dilute the colours, and occaſion undulations in the painting.

The beauty of the work depends on this laſt ſizing; for if any part is omitted, the varniſh will penetrate into the colours and give it a darker ſhade.

30 Seventh operation.

When the ſizing is dry, lay on two or three layers of ſpirit of wine varniſh, taking care that the place on which you lay it be warm, and the work is finiſhed.

§ 8. *Of the King's White.*

This derives its name from the uſe of it in the apartments of the French king. It is in all reſpects conducted like the former, except that there is only a ſmall quantity of indigo, to take the yellow from the white, without any black of charcoal, and without varniſh.

This white anſwers extremely well for apartments which are ſeldom uſed; but otherwiſe it ſpoils eaſily, eſpecially in bedchambers. It is the beſt white where there is any kind of gilding; and in this caſe it receives a little varniſh.

SECT. III. *Of Painting in Oil Colours.*

To paint in oil is to apply to all ſorts of ſubjects, as walls, wood, cloths, and metals, coloured earths grinded and diluted in oil. The ancients are thought to have been ignorant of this art, and the honour of the diſcovery is generally aſcribed to John Van Eyck a Flemiſh painter. The ſecret is nothing more than ſubſtituting oil in place of water in grinding and diluting colours.

By means of oil the colours are longer preſerved; and not drying ſo ſpeedily, they give painters longer time to ſmooth, finiſh, and retouch, their works; the colours being more marked, and mixing better together, give more diſtinguiſhable tints, and more vivid and agreeable gradations, and the colouring is more ſweet and delicate.

The painting in oil conſiſts of two kinds, namely, of that in ſimple oil and of that in poliſhed oil varniſh.

§ 1. *Obſervations on Painting in Oil.*

1. When bright colours, as white or gray, are grinded and diluted in oil, it is neceſſary to make uſe of the

oil of walnuts; but if the colours be dark, ſuch as cheſnut, or olive, or brown, you muſt make uſe of pure linſeed oil.

2. When the colours are grinded and diluted in oil, they muſt be laid on cold except on a new or moiſt plaſter, which requires them to be boiling.

3. Every colour diluted in pure oil, or in oil mixed with eſſence, ought to fall in threads from the end of the bruſh.

4. Take care to ſtir from time to time your colour before taking it up on the bruſh, that it may preſerve an equal thickneſs, and conſequently the ſame tone. Notwithſtanding the precaution of ſtirring, if it is found to be thicker towards the bottom, it will be neceſſary to pour in from time to time a little oil.

5. In general, every ſubject which is painted in oil ought firſt to receive one or two layers of white ceruſe, grinded and diluted in oil.

6. When the painting is expoſed to the air, as in doors, windows, and other works, which cannot be varniſhed, it is neceſſary to make theſe layers with pure oil of walnuts, mixed up with about one ounce of eſſence to a pound of colours; more would make the colours brown, and occaſion them to fall off in duſt; but this quantity prevents the ſun from bliſtering the work.

7. In ſubjects on the inſide of the houſe, or when the painting is varniſhed, the firſt layer ought to be grinded and diluted in oil, and the laſt diluted with pure eſſence.

8. If copper or iron, or other hard ſubſtances, are to be painted, it is neceſſary to mix a little eſſence with the firſt layers, to make the oil penetrate into them.

9. When there are many knots in the ſubject, as is particularly the caſe with fir wood, and when the colour does not eaſily take impreſſion on theſe parts, it is neceſſary, when you paint with ſimple oil, to lay on a little oil mixed with litharge on the knots. If you paint with poliſhed oil varniſh, it is neceſſary to apply a hard tint, which we ſhall have occcaſion to ſpeak of afterwards. A ſingle layer well applied is generally ſufficient to give a body to the wood, and make the other layers apply eaſily.

10. There are colours, ſuch as what the French call *ſtils-de-grain*, black of charcoal, and eſpecially bone and ivory blacks, which are difficult to dry when grinded in oil. To remedy this inconveniency, the following ſiccatives are mixed with the colours, to make them dry, viz. litharge both of the ſilver and gold colour, vitriol or copperas, and what is called *ſiccative oil.*

§ 2. *Obſervations on the Siccatives.*

1. Do not mix the ſiccatives with the colours till they are to be employed, otherwiſe it will thicken them.

2. Mix it only in very ſmall quantities in tin, wherein there is white lead or ceruſe, becauſe thoſe colours are ſiccative of themſelves, eſpecially when they are diluted in eſſence.

3. In painting which is to be varniſhed, give the ſiccative only to the firſt layer, and allow the other layers, in which there is eſſence, to dry of themſelves.

4. In dark colours in oil, give to every pound of colours in diluting them half an ounce of litharge; to bright colours, a drachm of white copperas grinded in walnut oil.

5. When in place of litharge or copperas the ſiccative oil is employed, it requires a quartern of this oil to every pound of colour.

The ſiccative oil is prepared of one half ounce of litharge, as much of calcined ceruſe, as much of *terre d'ombre*, a colour with which the French paint ſhadows, and as much of talc boiled for two hours on a ſlow and equal fire, with one pound of linſeed oil, and ſtirred the whole time. It muſt be carefully ſkimmed and clarified, and the older it grows it is better.

§ 3. *Obſervations on the Quantities of Subſtances and Liquids.*

1. Ochres and earths require more liquids both in grinding and diluting than ceruſe.

2. Different quantities of liquids are required in the grinding only on account of greater or leſs dryneſs; but in diluting, the quantity is always the ſame.

3. For the firſt layer after the priming, which has no relation to the colours laid on afterwards, to a ſquare fathom give fourteen ounces of ceruſe, about two ounces of liquid to grind, and four ounces to dilute it. If there is a ſecond layer of the ſame materials, the quantities will require to be leſs.

4. It will require three pounds of colour for three layers of a ſquare fathom. The firſt may conſume eighteen ounces, the ſecond ſixteen, and the third fourteen.

5. To compoſe theſe three pounds of colour, take two or two and a half pounds of grinded colours, and dilute them in a pint or three half pints of oil, mixed with eſſence or pure oil. But if the firſt layer of ceruſe is not uſed, there will be a neceſſity for a greater quantity of colours.

N. B. In the following kinds and applications of oil painting, we are to hold thoſe proportions in our eye.

§ 4. *Painting in ſimple Oil.*

31 Of doors, windows, and window ſhutters.

On doors and windows give a layer of ceruſe grinded in oil of walnuts diluted in the ſame oil, together with a little ſiccative; then give another layer of the ſame preparation; to which, if you want a grayiſh colour, add a little black of charcoal and Pruſſian blue, grinded alſo in oil of walnuts. If to theſe you incline to add a third layer, grind and dilute it in pure walnut oil; obſerving that the two laſt layers be leſs clear, or have leſs oil in them, than the firſt; the colour in this caſe is more beautiful and leſs apt to bliſter with the ſun.

32 Of walls.

Walls that are to be painted muſt be very dry; and this being ſuppoſed, give two or three layers of boiling linſeed oil to harden the plaſter; then lay on two layers of ceruſe or ochre, grinded and diluted in linſeed oil; and when theſe are dry, paint the wall.

33 Of tiles.

To paint tiles of a ſlate colour, grind ſeparately ceruſe and German black in linſeed oil; mix them together in the proportion which the colour requires, and dilute them in linſeed oil: then give the firſt layer very clean to prime the tiles; and make the three next layers thicker, to give ſolidity to the work.

To paint arbours and all kinds of garden work, give

34
Of arbours, &c.

give a layer of white ceruſe grinded in oil of walnuts, and diluted in the ſame oil, with the addition of a little litharge, then give two layers of green, compoſed of one pound of verdigris and two pounds of white lead, grinded and diluted in oil of walnuts. *N. B.* This green is of great ſervice in the country for doors, window ſhutters, arbours, gardens, ſeats, rails, either of wood or iron; and in ſhort for all works expoſed to the injuries of the weather.

35
Of ſtatues and vaſes.

To whiten ſtatues, vaſes, and all ornaments of ſtone, either within or without doors; firſt clean the ſubject well, then give one or two layers of white ceruſe, grinded and diluted in pure oil of pinks, and finiſh with giving one or many layers of white lead prepared in the ſame manner.

36
Painting on the inſide of the houſe.

If you wiſh to paint on walls not expoſed to the air, or on new plaſter, give one or two layers of boiling linſeed oil, and continue the bruſh till the walls are fully ſoaked; then give a layer of white ceruſe, grinded in oil of walnuts, and diluted with three-fourths of the ſame oil and one-fourth eſſence; and laſtly, give two layers more of white ceruſe, grinded in oil of walnuts and diluted in oil mixed with eſſence, if it is not to be varniſhed; but in pure eſſence if it is. It is in this manner that walls are painted white. If you adopt another colour, it is neceſſary to grind and dilute it in the ſame quantities of oil and eſſence.

37
Chairs, benches, ſtone, and plaſter.

To paint chairs, benches, ſtone, or plaſter, give a layer of white ceruſe grinded in oil of walnuts and diluted in the ſame oil, into which you have caſt a little litharge to make it dry; then apply a layer of the tint you fix on, grinded in oil and diluted in one part oil and three parts eſſence; and afterwards give two more layers of the ſame tint grinded in oil and diluted in pure eſſence: This may be varniſhed with two layers of ſpirit of wine.

38
Steel colour for locks.

To make a ſteel colour, grind ſeparately in eſſence, white ceruſe, Pruſſian blue, fine lac, and verdigris. The tone which you require is procured by the proper mixture of thoſe ingredients. When you have fixed on the tone of colour, take about the ſize of a walnut of the ingredients, and dilute them in a ſmall veſſel in one part of eſſence and three parts of white oily varniſh. *N. B.* This colour is generally made of white ceruſe, of black charcoal, and Pruſſian blue, grinded in thick oil, and diluted in eſſence, which is the cheapeſt method of procuring it; but the former is the moſt beautiful.

39
Balluſtrades and railings.

For painting balluſtrades and railings, dilute lamp black with varniſh of vermilion; giving two layers of it, and afterwards two layers of ſpirit of wine varniſh.

40
Wainſcotting of apartments.

Since the diſcovery of oil painting, and the knowledge that wood is preſerved by it, and eſpecially ſince the diſcovery of a varniſh without ſmell, and which even takes away that of oil, the painting of apartments in oil has been with juſtice preferred.

In fact the oil ſtops up the pores of the wood; and although it does not altogether reſiſt the impreſſion of moiſture, yet the effect is ſo little perceptible, that it is to be recommended as the beſt method of preſerving wood.

To preſerve wainſcotting in the moſt effectual manner from moiſture, it is neceſſary to paint the wall behind it with two or three layers of common red, grinded and diluted in linſeed oil.

To paint the wainſcotting itſelf, give a layer of white ceruſe grinded in oil of walnuts, and diluted in the ſame oil mixed with eſſence. This layer being dry, give two more of the colour you have adopted, grinded in oil and diluted in pure eſſence. If you wiſh the mouldings and ſculpture to be painted in a different colour, grind and dilute it in the ſame manner.

Two or three days after, when the colours are fully dry, give two or three layers of your white varniſh without ſmell, and which alſo prevents the offenſive ſmell of the oil colours. *N. B.* Thoſe who begin their operations in water colours, if they find it more agreeable, may finiſh it in oil colours as above.

When the pores of the wood are well ſtopped by the prepared white, a layer of white ceruſe grinded in oil of walnuts, and diluted in the ſame oil, mixed with eſſence, may be applied. This will be ſufficient, the wood being previouſly primed; and afterwards lay on your intended colour and varniſh.

§ 5. *Painting in Oil with the poliſhed Varniſh.*

This is the beſt kind of oil painting, owing more to the care it requires than to the proceedings, for they are nearly the ſame with thoſe of ſimple oil painting; the difference conſiſting only in the preparation and manner of finiſhing.

41
Wainſcottings.

To paint wainſcottings of apartments with the poliſhed varniſh, it is neceſſary, in the firſt place, that the pannels be new. Then,

1. Make the ſurface of the ſubject which you mean to paint very ſmooth and level, which is done by a layer, which ſerves to receive the hard tint or poliſhed ground and the colours.

This layer ought to be of white, whatever colour you are afterwards to apply. It conſiſts of white ceruſe, grinded very fine in linſeed oil, with a little litharge, and diluted in the ſame oil mixed with eſſence.

2. Make the poliſhed ground by ſeven or eight layers of the hard tint. In painting equipages, a dozen is neceſſary.

The hard tint is made, by grinding pure white ceruſe, which has not been much calcined, very finely in thick oil, and diluting it with eſſence. You muſt take care that the layers of the hard tint be not only equal as to the application, but to the quantity of the white ceruſe and the oil, and to the degree of calcination. Then,

3. Soften this ground with pumice ſtone.

4. Poliſh it moderately with a piece of ſerge ſoaked in a pail of water, in which you have put ſome powder of pumice ſtone finely grinded and paſſed through a fine ſieve. There is no occaſion to ſpare waſhing, as this part of the operation will not ſpoil with water.

5. Chooſe the tint with which you intend to decorate your apartment; grind it in oil, and dilute it in eſſence; paſs it through a piece of very fine ſilk, give two or three layers carefully and thinly ſpread over the ſurface, as on this part of the operation depends in a great meaſure the beauty of the colour. All ſorts of

Painting on Oil Colours.

colours may be employed in this manner in oil of eſſence.

6. Give two or three layers of a ſpirit of wine varniſh, if it is to wainſcotting; if to the body of a coach, a varniſh of oil is employed. If the varniſh is to be poliſhed, it is neceſſary to give ſeven or eight layers at leaſt, laid on equally and with great precaution, not to be thicker in one place than another, which occaſions ſpots.

7. It is again poliſhed with pumice ſtone reduced to powder, and water, and a piece of ſerge. If the wainſcotting has been painted before, it is neceſſary to rub off the colour till you come to the hard tint, which is done with pumice ſtone and water, or with a piece of linen dipped in eſſence.

42 White varniſh poliſh in oil.

There is a white painting in oil, called *white varniſh poliſh*, which correſponds to the king's white in water colours, and is equal to the freſhneſs and gloſs of marble if it is applied to wood. To paint in this manner,

1. Give a layer of white ceruſe grinded in oil of walnuts, with a little calcined copperas, and diluted in eſſence. But if it is applied to ſtone, it is neceſſary to employ oil of walnuts and calcined copperas alone.

2. Grind white ceruſe very fine in eſſence, and dilute it in fine white oil varniſh with copal.

3. Give ſeven or eight layers of it to the ſubject.— The varniſh mixed with the white ceruſe dries ſo promptly, that three layers of it may be given in a day.

4. Soften and poliſh all the layers as above.

5. Give two or three layers of white lead grinded in oil of walnuts, and diluted in pure eſſence.

6. Give ſeven or eight layers of white ſpirit of wine varniſh, and then poliſh them.

§ 6. *Of Painting in Varniſh.*

To paint in varniſh, is to employ colours grinded and diluted in varniſh, either in ſpirits of wine or oil, on all ſorts of ſubjects. Wainſcotting, furniture, and equipages, are painted in this manner, though we ſhall confine ourſelves to the firſt.

1. Give two layers of white of Bougival, diluted in a ſtrong ſize boiling hot.

2. Give a layer of what the French call *de blanc apprit.*

3. Full up the defects of the wood with maſtich in water; and when the layers are dry, ſmooth them with the pumice ſtone.

4. When the wood is ſmooth, ſuppoſe the paint a gray colour, take one pound of white ceruſe, one drachm of Pruſſian blue, or of black of charcoal or ivory black; put the white into a piece of leather, ſo tied that the colours cannot eſcape; ſhake them till they are ſufficiently mixed.

5. Put two ounces of colours into a quartern of varniſh, mix them carefully; give one layer above the white.

6. This layer being dry, put one ounce of colours into the ſame quantity of varniſh as above, and give a ſecond layer.

7. To the third layer give half an ounce of colour to the ſame quantity of varniſh.

8. As each of theſe layers dry, be careful to rub them with a piece of new coarſe cloth, in ſuch a manner, however, as not to injure the colour. *N. B.* The three layers may be given in one day.

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9. If you want to give a perfect luſtre, add a fourth layer prepared as the third.

All other colours, as blue, &c. may be applied in the ſame manner. This method is the only one by which orpiment can be employed in all its beauty, but not without ſome of its inconveniences.

Another manner of performing this kind of work, is to apply the colours and the varniſh without previouſly uſing the ſize and the white ground. This is extremely expeditious, but it is eaſy to perceive it will want the poliſh and brilliancy of the other.

SECTION IV.

We cannot perhaps more properly conclude this article, than with an account of M. de Morveau's attempts to render more perfect the proportion of colours, and eſpecially of *white*, employed in painting. Theſe we ſhall extract from a memoir of his read in the Academy of Dijon.

"White (ſays the ingenious academician) is the moſt important of all colours in painting. It affords to the painter the materials of light, which he diſtributes in ſuch a manner as to bring his objects together, to give them relief, and that magic which is the glory of his art. For theſe reaſons I ſhall confine my attention at preſent to this colour.

43 Examination of known whites.

"The firſt white which was diſcovered, and indeed the only one yet known, is extracted from the calx of lead. The danger of the proceſs, and the dreadful diſtemper with which thoſe employed in it are often ſeized, have not yet led to the diſcovery of any other white. Leſs anxious, indeed, about the danger of the artiſt than the perfection of the art, they have varied the preparation, to render the colour leſs liable to change. Hence the different kinds of white, viz. white of crems in Auſtria, white lead in ſhells, and white ceruſe. But every perſon converſant in colours, knows that the foundation of all theſe is the calx of lead, more or leſs pure, or more or leſs loaded with gas. That they all participate of this metallic ſubſtance, will indeed appear evident from the following experiment, which determines and demonſtrates the alterability of colours by the phlogiſtic vapour.

"I poured into a large glaſs bottle a quantity of liver of ſulphur, on a baſis of alkali, fixed or volatile, it makes no difference; I added ſome drops of diſtilled vinegar, and I covered the mouth of the bottle with a piece of paſteboard cut to its ſize, on which I diſpoſed different ſamples of crems, of white lead, and of ceruſe, either in oil or in water; I placed another ring of paſteboard over the firſt, and tied above all a piece of bladder round the neck of the bottle with a ſtrong packthread. It is evident, that in this operation I took advantage of the means which chemiſtry offers to produce a great quantity of phlogiſtic vapour, to accompliſh inſtantaneouſly the effect of many years; and, in a word, to apply to the colours the very ſame vapours to which the picture is neceſſarily expoſed, only more accumulated and more concentrated. I ſay the ſame vapour, for it is now fully eſtabliſhed, that the ſmoke of candles, animal exhalations of all kinds, alkaleſcent odours, the electric effluvia, and even light, furniſh continually a quantity more or leſs of matter, not only analagous, but identically the ſame with the vapour of vitriolic acid mixed with ſulphur.

“ If it happens that the ſamples of colours are ſenſibly altered by the phlogiſtic vapour, then we may conclude with certainty, that the materials of which the colours are compoſed, bear a great affinity to that vapour; and ſince it is not poſſible to preſerve them entirely from it in any ſituation, that they will be more or leſs affected with it, according to the time and a variety of circumſtances.

“ After ſome minutes continuance in this vapour, I examined the ſamples of colours ſubmitted to its influence, and found them wholly altered. The ceruſe and the white lead both in water and oil were changed into black, and the white of crems into a browniſh black; and hence thoſe colours are bad, and ought to be abandoned. They may indeed be defended in ſome meaſure by varniſh: but this only retards for a time the contact of the phlogiſtic vapour; for as the varniſh loſes its humidity, it opens an infinite number of paſſages to this ſubtile fluid.

“ After having aſcertained the inſtability of the whites in common uſe, I made ſeveral attempts to diſcover ſuch as would prove more laſting; and though many of theſe attempts were without effect, I ſhall give a ſuccinct account of the whole, which may ſave a great deal of trouble to thoſe who wiſh to travel over the ſame field.

“ There are three conditions eſſential to a good colour in painting.

“ *Firſt*, That it dilute eaſily, and take a body both with oils and with mucilages, or at leaſt with the one or other of theſe ſubſtances, a circumſtance which depends on a certain degree of affinity. Where this affinity is too ſtrong, a diſſolution enſues; the colour is extinguiſhed in the new compoſition, and the maſs becomes more or leſs tranſparent; or elſe the ſudden re-action abſorbs the fluid, and leaves only a dry ſubſtance, which can never again be ſoftened. But if the affinity is too weak, the particles of colour are ſcarcely ſuſpended in the fluid, and they appear on the canvaſs like ſand, which nothing can fix or unite.

“ The *ſecond* condition is, That the materials of which colours are compoſed do not bear too near an affinity with the phlogiſtic vapour. The experiments to which I ſubmitted whites from lead, is an infallible means of aſcertaining the quality of colours in this reſpect, without waiting for the ſlow impreſſion of time.

“ A *third* condition equally eſſential is, That the colouring body be not volatile, that it be not connected with a ſubſtance of a weak texture, ſuſceptible of a ſpontaneous degeneracy. This conſideration excludes the greater part of ſubſtances which have received their tint from vegetable organization; at leaſt it makes it impoſſible to incorporate their finer parts with a combination more ſolid.

“ After theſe reflections, my reſearches were directed, firſt, to the five pure earths; next, to the earthy compounds; in the third place, to the earthy ſalts, which can ſcarcely be diſſolved; laſtly, to the metallic earths, either pure or precipitated by Pruſſian alkali. M. Wenzel has diſcovered a ſixth earth, which I call *eburne*, and which, after other experiments, I thought of applying to the purpoſes of painting; but I ſoon perceived that it would have the ſame fault with other kinds of earth, and, beſides, that it could not be obtained but at a very conſiderable expence.

“ The five pure earths poſſeſs fixity in a very great degree, and at the ſame time are little affected by the phlogiſtic vapour; but they refuſe to unite with oil or mucilages, and the white is totally extinguiſhed when they are grinded with theſe liquids. I made ſeveral attempts on earth from alum, not only becauſe M. Beaumé recommended the uſe of it in painting, and becauſe it enters into the compoſition of Pruſſian blue, but alſo becauſe it is a chief ingredient in ochres, and other earths of that nature, which ſuppoſes that it ſhould unite in a certain degree with diluting liquors; notwithſtanding, in whatever manner I treated it, it would not yield a white; but one will be leſs ſurpriſed at this want of ſucceſs, when he conſiders, that in the ochres and Pruſſian blue, the earth from alum is only the vehicle of the colouring body, whereas here it is the colour itſelf.

“ To be convinced of the truth of this obſervation, it is only neceſſary to mix equal parts of this earth, or even of clay not coloured, with ceruſe or any other white: the mixture will be ſuſceptible of being grinded in oil or in gum without being extinguiſhed; it will eaſily unite with any coloured ſubſtance, and be productive of no bad conſequences to the pure earths.

Nature and art preſent to us a conſiderable number of earthy compoſitions ſufficiently white for the purpoſes of painting; ſuch as the jaſper white, the feldſpat white, the ſchirl white, &c. But all theſe ſubſtances, in all the trials which I made, had the fault which I have already mentioned; and originating from the ſame cauſe, they wanted a fixed colouring body, which would not change when it is pulverized, nor be extinguiſhed when it is diluted.

“ The ultramarine blue, which is extracted from the blue jaſper, and known by the name of lapis lazuli, ſeems at firſt view to warrant the poſſibility of appropriating to painting all the opaque half vitrified compoſitions of the nature of jaſper.

“ Prepoſſeſſed with this idea, I conceived the hope of producing a true white lapis; but I ſoon perceived that the experiment confirmed the principle which I had laid down from my obſervations on pure earths; ſince it is not the ſubſtance peculiar to the jaſper which conſtitutes the ultramarine blue, but the metallic ſubſtance which accidentally colours this particular kind of jaſper.

“ In the ſame manner, art in this imitation of nature ſhould have for its object to give a permanent baſe to a colour already formed, to fix it without altering, and to augment perhaps its ſplendour and its intenſity, without attempting to produce a colour.

“ In excepting from earthy and metallic ſalts all thoſe of which the acid is not completely ſaturated, which would eaſily attract the humidity of the air, or which would be eaſily diſſolved, you have but a very ſmall number to make experiments on.

“ The natural and artificial *ſelenite* gives with oil a paſte without colour, and taſting ſomewhat like honey; its white is better preſerved with a gum, but even in this caſe it reſembles a half tranſparent pap.

“ The natural or regenerated *ſpat perant* is the moſt likely ſalt to produce white. As it is of all others the

Proportion of Colours.

moſt difficult to diſſolve, it appears after pulverization to be a very fine white, but is ſcarcely touched with oil when it becomes gray and half tranſparent: the mucilage alters it alſo, although leſs diſcernibly; and it does not even reſume its white colour after it becomes dry on the canvaſs.

“ The ſame is the caſe with *calcareous borax*, formed by the ſolution of borax in lime water; its white is completely extinguiſhed with oil, leſs ſo with gum; but it hardens ſo inſtantaneouſly with the latter, that it is impoſſible ever to dilute it again.

“ Calcareous tartar, obtained by caſting quicklime into a boiling ſolution of cream of tartar, is affected with oil in the ſame manner as ſelenite; but with mucilaginous water it gives a pretty good white, only poſſeſſed of little reflection, and appearing like plaſter; it applied very well to the canvaſs, and reſiſted the phlogiſtic vapour.

“ According to M. Weben, in his work entitled *Fabriben and Kunſte*, publiſhed 1781, the white called in Germany *krembſer wieſs*, is nothing but the vitriol of lead, prepared by diſſolving lead in nitrous acid, and precipitating it in vitriolic acid; and forming it afterwards into ſolid tablets by means of gum water. It is certain that this reſembles in no ſhape the white called in France the white of crems; at leaſt I never found that it could be diſſolved in vinegar; but I tried the white prepared in M. Weben's manner, and the reſult was the ſame as above, that is to ſay, it turned completely black.

“ The vitriols of lead and of biſmuth alter more ſpeedily than the calces of thoſe metals. And thus, with the exception of calcareous tartar, which may be of ſome uſe in water colours, the beſt earthy ſalts on which I have made experiments, may all, or the moſt of them, give a baſe to ſome colours, but cannot conſtitute by themſelves a colour uſeful in painting.

“ Of the fifteen known metallic ſubſtances, there are nine which yield white calces: namely, ſilver, mercury, lead, tin, antimony, biſmuth, zinc, arſenic, and manganeſe.

“ Of theſe nine ſubſtances, we may almoſt paſs over ſilver and mercury; becauſe, though they yield a very fine white, precipitated by means of cryſtallized vegetable alkali, yet it is ſoon altered when expoſed to the air; that from ſilver changing into black, and that from mercury into yellow.

“ It is well known that lead gives a very good white, and one which unites eaſily with oil or ſize; but that it is extremely liable to change, has been my principal object to prove; and the experiments which I have made place it beyond contradiction.

“ I ſhall only add, that if there is a preparation able to correct this fault, it ſhould be the precipitation of the earth of this metal in its acetous diſſolution by Pruſſian alkali; but the white which reſults from this preparation becomes ſenſibly browniſh when it is expoſed a few minutes only to the phlogiſtic vapour.

“ It would be therefore unreaſonable to perſevere in the uſe of this ſubſtance, or to wiſh to render it fixed, ſince the changes which it undergoes do not alter its nature, and the indeſtructible order of its affinities.— The calx of tin is eaſily applied to any purpoſe, and experiences no change from the concentrated phlogiſtic vapour. Theſe conſiderations induced me to endeavour to obtain this calx perfectly white; and here follows the reſult of my operations: The tin of calcined *melac* gives a pretty white calx; but whatever attention I paid to take off the red ſurface which the violence of the fire occaſioned, it takes always a ſhade of gray when it is diluted. Tin calcined by nitre in fuſion, gives a tarniſhed and groſs calx, which multiplied waſhings could not deprive of a yellowiſh tint.

“ Having precipitated, by means of cryſtallized vegetable alkali, a ſolution of Engliſh tin, which had been made in the muriatic acid, after the manner of M. Bayen to extract the arſenic, I had a calx of the greateſt whiteneſs, ſo light that it buoyed up to the ſurface of the liquor, and ſo thin that the greater part of it paſſed through the filter; but it experience at the ſame time a kind of adherence with the ſalts, which makes the part of it retained by the filter incapable of being pulverized, gummy, half tranſparent, and even a little changed into yellow. In this condition it is extinguiſhed when diluted; it is neceſſary, therefore, to moiſten it in boiling water, and afterwards to calcine ſlightly the ſediment after it has had ſufficient time to ſettle.

“ I have tried the calcination by means of moiſture, in employing the tin of the pureſt melac, and a rectified nitrous acid, according to the method of Meyer. It formed a very white ſparkling calx, which remained in the filter in the conſiſtency of jelly.— Meanwhile, I obſerved that it was always a little yellow by the mixture of a portion of that earth which took, in the operation, the colour of turbith mineral.

“ A very fine white calx is extracted from antimony, calcined by nitre in fuſion; but the earth of this ſemi-metal muſt be placed in the number of thoſe which combine too eaſily with the phlogiſtic vapour. The diaphoretic antimony, grinded in oil, took in ten minutes in my phlogiſtic apparatus a colour ſomewhat like ſulphur.

“ The property of biſmuth to give a very fine white calx, known by the name of *magiſtery*, or white fard, is generally known; it is eaſily prepared, ſince it is only neceſſary to diſſolve the biſmuth in nitrous acid, and to precipitate the ſolution by pure water: it dilutes perfectly with oil and mucilages. But this colour ought to be rejected, as the moſt alterable by the phlogiſtic vapour. It became completely black in ten minutes in my apparatus; and this fact is alſo proved from what happens to women who uſe this colour, when they are expoſed to the vapours of ſulphur, of garlic, or of any putrid ſubſtances.

“ Zinc furniſhes by all the proceſſes of calcination and precipitation a pretty white calx, when it is pure and ſeparated from iron; otherwiſe the ſolutions of the vitriol of zinc will become yellow when expoſed to the air. I have precipitated thoſe ſolutions by lime water, by cauſtic, and efferveſcent alkalis; I have calcined this ſemi-metal alone and with nitre; and in alſo thoſe operations I have obtained an earthy ſubſtance of different degrees of whiteneſs, which, after it was dried and prepared, mixed readily with oil and mucilages without loſing its colour; and which experienced no ſenſible change when expoſed to the phlogiſtic vapour.

“ Theſe valuable properties, the chief object of my reſearches, engaged me to multiply my experiments, to determine at once the moſt economical proceſs, and the moſt advantageous and infallible preparation.—Theſe attempts have convinced me, that the calcination of this ſemi-metal alone in a crucible, placed horizontally on the corners of a reverberating furnace, gives the pureſt, the whiteſt, and the leaſt reducible calx; and that to make an excellent colour, it is ſufficient to ſeparate the parts not burned with water, and grind it with a little of the earth of alum or chalk to give it a body. Zinc precipitated in Pruſſian alkali, even in diſtilled vinegar, retains always a ſhade of yellow, does not unite ſo well in oil, and takes a demitranſparent conſiſtence like cheeſe.

“ White arſenic extinguiſhes much leſs in diluting than one would believe from its ſaline nature; it preſerves its colour beſt in gum water; and it is remarkable, that inſtead of turning black in the phlogiſtic vapour, it takes a very diſtinct ſhade of yellow. This property is ſufficiently ſingular and conſtant to furniſh a new method of analyzing arſenic, ſo as to know it. And this alteration of colour makes it of no uſe in painting, although its deleterious qualities did not forbid the practice.

“ The ſemi-metal known by the name of *manganeſe* gives alſo a white calx. I had at firſt great hopes from this colour, as, contrary to all thoſe extracted from the other metals, it became white by the phlogiſtic vapour. There remained, therefore, but one difficulty to overcome, viz. to ſeparate from the manganeſe the portion of iron which it uſually contained, and which infallibly makes the earth a little yellow. To accompliſh this in the cheapeſt manner, I ſubmitted the black ore of the manganeſe to a long calcination, to render its iron inſoluble; I afterwards applied vinegar to it, after the example of M. de la Peyrouſe; and in precipitating the diſſolution by effervеſcent alkali, I eaſily obtained a pure white precipitate. But I ſoon perceived that the facility with which a colouring body loſes its phlogiſton, is no leſs an inconveniency than that of attracting it, and productive of the ſame alterations.

“ The white of manganeſe became very ſoon yellow when expoſed to the air: and this is not to be aſcribed to the iron contained in it, ſince neither the galls nor Pruſſian alkali had diſcovered any of it in the diſſolution. This ſubſtance, therefore, can be of no uſe in producing a white colour for painting.”

The experiment by which M. de Morveau tried the colours not alterable by the phlogiſtic vapour, was performed before the academy, the prince of Condé being preſident. “ I placed (ſays he) in my apparatus pieces of cloth, on which were laid the white of calcareous tartar in water, different preparations of white from tin and zinc, in oil and water; and I allowed them to continue expoſed to the phlogiſtic vapour during a ſitting of the academy: if they were not altered, their ſuperiority over the whites in uſe would be ſufficiently eſtabliſhed. The ſitting continued for near an hour; and the bottle having been opened, all the colours continued to have the ſame ſhade which they had before. I can, therefore, recommend to painters thoſe three whites, and particularly that of zinc, the preparation of which is expoſed to leſs variation, the ſhade more lively and uniform, and moreover it is fit for all purpoſes, and perhaps procured at leſs expence.

“ I will aſſert farther, that it may be procured in ſufficient quantities to ſupply the place of ceruſe in every branch of the art, even in interior houſe painting:—I would recommend it, leſs with the view of adding new ſplendour to this kind of ornament, than for the ſafety of thoſe who are employed in it, and perhaps for the ſafety of thoſe who inhabit houſes ornamented in this manner.

“ But without being too ſanguine, although the proceſſes in the fabrication be ſimplified in proportion to the demand, as is uſually the caſe, yet there is reaſon to apprehend, that the low price of ceruſe will always give it the preference in houſe painting. With regard to thoſe who apply colours to nobler purpoſes, they will not heſitate to employ the white of zinc. I am aſſured that four franks is paid for the pound of white of crems; and I believe the white in queſtion, prepared in the manner which I have poined out, might be ſold for ſix.

“ M. Courtors, connected with the laboratory of the academy, has already declared that it is uſed for houſe painting: leſs, however, in regard to its unalterability, than to its ſolubility: and this can be the more readily believed, as the flower of zinc enters into many compoſitions of the apothecary. The ſame M. Courtors has arrived at the art of giving more body to this white, which the painters ſeemed to deſire, and alſo of making it bear a compariſon with white lead either in water or oil. The only fault found with it, is its drying ſlowly when uſed in oil; but ſome experiments which I have made, incline me to believe that this fault may be eaſily remedied, or at leaſt greatly corrected, by giving it more body. At any rate, it may be rendered ſiccative at pleaſure, by adding a little vitriol of zinc or copperas ſlightly calcined.

“ Painters already know the properties of this ſalt, but perhaps they do not know that it mixes with the white of zinc better than with any other colour; the reaſon is, they have chemically the ſame baſe. It is prepared by purging the white copperas of that ſmall portion of iron which would render it yellow; and this is eaſily done in digeſting its ſolution, even when cold, on the filings of zinc.

“ The mixture of this ſalt thus prepared is made on the pallet, without producing any alteration, and a ſmall quantity will produce a great effect.”

PAIR; two of a ſort, a couple.

PAIRING, the uniting or joining in couples.

The inſtinct of pairing is beſtowed on every ſpecies of animals to which it is neceſſary for rearing their young; and on no other ſpecies. All wild birds pair; but with a remarkable difference between ſuch as place their neſts on trees and ſuch as place them on the ground. The young of the former, being hatched blind, and without feathers, require the nurſing care of both parents till they be able to fly. The male feeds his mate on the neſt, and cheers her with a ſong. As ſoon as the young are hatched, ſinging yields to a more neceſſary occupation, that of providing food for a numerous iſſue; a taſk that requires both parents.

Eagles and other birds of prey build on trees, or on other inacceſſible ſpots. They not only pair, but continue in pairs all the year round; and the ſame pair procreates year after year. This at leaſt is the caſe of eagles: the male and female hunt together, unleſs during incubation, at which time the female is fed by the male. A greater number than a ſingle pair are never ſeen in company.

Gregarious birds pair, in order probably to prevent diſcord in a ſociety confined to a narrow ſpace. This is the caſe particularly of pigeons and rooks. The male and female ſit on the eggs alternately, and divide the care of feeding their young.

Kames's Sketches, Vol. I. p. 198.

Partridges, plovers, pheaſants, ſea fowl, grouſe, and other kinds that place their neſts on the ground, have the inſtinct of pairing; but differ from ſuch as build on trees in the following particular, that after the female is impregnated, ſhe completes her taſk without needing any help from the male. Retiring from him, ſhe chooſes a ſafe ſpot for her neſt, where ſhe can find plenty of worms and graſs ſeed at hand; and her young, as ſoon as hatched, take foot, and ſeek food for themſelves. The only remaining duty incumbent on the dam is, to lead them to proper places for food, and to call them together when danger impends. Some males, provoked at the deſertion of their mates, break the eggs if they ſtumble on them. Eider ducks pair like other birds that place their neſts on the ground; and the female finiſhes her neſt with down plucked from her own breaſt. If the neſt be deſtroyed for the down, which is remarkably warm and elaſtic, ſhe makes another neſt as before. If ſhe is robbed a ſecond time, ſhe makes a third neſt; but the male furniſhes the down. A lady of ſpirit obſerved, that the eider duck may give a leſſon to many a married woman, who is more diſpoſed to pluck her huſband than herſelf. The black game never pair: in ſpring, the cock on an eminence crows, and claps his wings; and all the females within hearing inſtantly reſort to him.

Pairing birds, excepting thoſe of prey, flock together in February, in order to chooſe their mates. They ſoon diſperſe; and are not ſeen afterward but in pairs.

Pairing is unknown to quadrupeds that feed on graſs. To ſuch it would be uſeleſs; as the female gives ſuck to her young while ſhe herſelf is feeding. If M. Buffon deſerves credit, the roe deer are an exception. They pair, though they feed on graſs, and have but one litter in a year.

Beaſts of prey, ſuch as lions, tygers, wolves, pair not. The female is left to ſhift for herſelf and for her young; which is a laborious taſk, and often ſo unſucceſsful as to ſhorten the life of many of them. Pairing is eſſential to birds of prey, becauſe incubation leaves the female no ſufficient time to hunt for food. Pairing is not neceſſary to beaſts of prey, becauſe their young can bear a long faſt. Add another reaſon, that they would multiply ſo faſt by pairing, as to prove troubleſome neighbours to the human race.

Among animals that pair not, males fight deſperately about a female. Such a battle among horned cattle is finely deſcribed by Lucretius. Nor is it unuſual for ſeven or eight lions to wage bloody war for a ſingle female.

The ſame reaſon that makes pairing neceſſary for gregarious birds, obtains with reſpect to gregarious quadrupeds; thoſe eſpecially who ſtore up food for winter, and during that ſeaſon live in common. Diſcord among ſuch would be attended with worſe conſequences than even among lions and bulls, who are not confined to one place. The beavers, with reſpect to pairing, reſemble birds that place their neſts on the ground. As ſoon as the young are produced, the males abandon their ſtock of food to their mates, and live at large; but return frequently to viſit them while they are ſuckling their young.

Hedgehogs pair, as well as ſeveral of the monkey kind. We are not well acquainted with the natural hiſtory of theſe animals; but it would appear that the young require the nurſing care of both parents.

Seals have a ſingular economy. Polygamy ſeems to be a law of nature among them, as a male aſſociates with ſeveral females. The ſea turtle has no occaſion to pair, as the female concludes her taſk by laying her eggs in the ſand. The young are hatched by the ſun, and immediately crawl to the ſea.

PAISLEY, a town of Renfrewſhire, in Scotland, ſituated about ſix miles and a half weſt of Glaſgow, on the river White Cart, over which there are two ſtone bridges of two arches each, and one which conſiſts of three arches. The town is very ancient; but was of much leſs conſequence formerly than it is at preſent. "No ſatisfactory etymology has hitherto occurred of the name *Paiſley*. The following has been ſuggeſted by a good Gaelic ſcholar: 'A ridge of rocks that runs acroſs the river, and forms a beautiful caſcade, would, prior to the building of the town, be undoubtedly the moſt ſtriking object that this place would preſent. The brow or face of a rock is in Gaelic *Pais-licht*. A church in front of the rock would be the church in *Pais-licht*. A church did ſtand here previous to 1160: it is named in the foundation charter *Ecclesia de Paſelet*, Latinized, in the records of the monaſtery, *Paſlatum*, an eaſy derivative from *Pais-licht* in all probability the original of the modern *Paiſley*.' It was erected into a burgh of barony by James IV. in the year 1488, at that time probably deriving all its importance from the rich monaſtery which had been eſtabliſhed there for ſeveral ages; for George Schaw, who was then abbot of that monaſtery which had been privileged from the king. Even in Mr Crawford's time wrote the hiſtory of the ſhire of Renfrew near the beginning of this century, it ſeems to have been but an inconſiderable place; for he deſcribes it as conſiſting only of one principal ſtreet, about half a mile in length, with ſeveral lanes belonging to it; whereas

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now the town, with its ſuburbs, occupies ſuch an extent of ground, that ſtrangers are apt to conſider it as, next to Edinburgh and Glaſgow, the largeſt and moſt populous town in Scotland. Its buildings of late years have been greatly improved; its ſtreets are well paved; and the different parts of the town and ſuburbs, where the river intervenes, are connected with one another by three bridges at convenient diſtances."

The affairs of the community are managed by three bailies, of which the eldeſt is commonly in the commiſſion of the peace, a treaſurer, a town clerk, and 17 counſellors, who are annually elected upon the firſt Monday after Michaelmas. It enjoys all the powers neceſſary for government and police, without any of the burdens to which royal boroughs are ſubjected. The freedom of the place is conferred on very moderate terms. The revenues of the town are not great, but they have been managed to the beſt advantage. The rapid increaſe of the place has not been attended with a proportional increaſe of revenue; therefore ſeveral neceſſary improvements, and intended public buildings, are not yet carried into execution. It gives the title of baron to the earls of Abercorn; the firſt of whom was a younger ſon of the Duc de Chatelherault. The *black book of Paiſley*, frequently mentioned in Scottiſh hiſtory, was a chronicle of the public affairs and remarkable events, kept by the monks who reſided in the monaſtery. It agreed in every material fact with the *Scoti-chronicon* of Fordun; and is by many thought to be the ſame performance.

The old part of the town runs from eaſt to weſt upon the ſouth ſlope of a ridge of hills, from which there is a fine proſpect of the city of Glaſgow and the adjacent country; but to the ſouthward, the view terminates in a ridge of green hills, about two miles diſtant. Including the late buildings and ſuburbs, it is fully a mile long, and nearly as much in breadth. On the eaſt ſide of the river Cart, ſtand the abbey and new town. This new town was ſome years ago feued off by the earl of Abercorn, and now conſiſts of a number of handſome buildings. The ſtreets are laid off in a regular manner, but (rather unfortunately for the conveniency and elegance of ſome of the houſes) not in right angles. Here the earl of Abercorn has built at his own expence one of the largeſt, moſt commodious, and moſt elegant inns in Scotland. In the vicinity of this his lordſhip is likewiſe to build ſeveral convenient and neceſſary market places. A little way ſouth of the inn ſtands the abbey church, the only one which Paiſley formerly required. This church, when entire, has been a moſt noble building, and conſiſted of ſeveral diſtinct and ſeparate places of worſhip: what now remains of this magnificent Gothic ſtructure is not yet unworthy the notice of the curious in antiquities. Mr Pennant ſays, the great north window is a noble ruin, the arch very lofty, the middle pillar wonderfully light, and ſtill entire: only the chancel now remains, which is divided into a middle and two ſide aiſles, by very lofty pillars, with Gothic arches; above theſe is another range of pillars much larger, being the ſegment of a circle, and above a row of arched niches from end to end, over which the roof ends in a ſharp point. The outſide of the building is decorated with a profuſion of ornaments, eſpecially the great weſt and north doors, than which ſcarce any thing lighter or richer can be imagined.

The town of Paiſley continued a part of the original or Abbey pariſh of Paiſley till the year 1738; when the magiſtrates and council having purchaſed the right of patronage from the then earl of Dundonald, a new church was built, and the town was erected into a ſeparate pariſh. This is called the *Laigh Church*, is built in the form of a Greek croſs, very well laid out, and capable of containing a great number of people. In 1756 another church was built, upon a very extended plan, to accommodate its multiplied inhabitants; in which, though it is one of the largeſt in Scotland, yet the moſt diſtant of the congregation can hear a tolerably good ſpeaker with eaſe and diſtinctneſs; and as it ſtands upon the higheſt part of the town, it was afterwards ornamented with a lofty and well-proportioned ſpire viſible at a great diſtance. This is called the *High Church*, and is a very fine building: it is an oblong ſquare of 82 feet by 62 within the walls, built of free ſtone well ſmoothed, having ruſtic corners and an elegant ſtone cornice at the top. In the conſtruction of the roof (which is a pavilion covered with ſlate, having a platform covered with lead on the top), there is ſomething very curious, and it is admired by every perſon of taſte. In 1781, the number of the inhabitants ſtill rapidly increaſing, another church, called the *Middle Church*, was built, not quite ſo large as the former, but very handſomely and elegantly finiſhed: and in the following year, the town was divided and erected into three ſeparate pariſhes, excluſive of the Abbey pariſh, and named according to their reſpective churches.

There are two large diſſenting congregations in the town; thoſe of the Antiburgher perſuaſion and the Relief. The firſt of theſe has exiſted there for upwards of 30 years; the other is of a late date. There is beſides a ſmall congregation of Cameronians.

The townhouſe is a very handſome building of cut ſtone, with a tall ſpire and a clock. The fleſh market has a genteel front of cut ſtone, and is one of the neateſt and moſt commodious of the kind in Britain. Butchers meat, butter, cheeſe, fiſh, wool, and ſeveral other articles, are ſold here by what they call the tron pound, of 22 Engliſh ounces and a half.

The poors houſe is a large building, very well laid out; and ſtands oppoſite to the quay, in a fine free air. It is ſupported by a ſmall tax laid upon the inhabitants quarterly.

Cloſe by the Abbey church is the earl of Abercorn's burial place, the greateſt curioſity in Paiſley. It is a vaulted Gothic chapel, without pulpit, pew, or any other ornament, but has the fineſt *echo* perhaps in the world. When the end door (the only one it has) is ſhut, the noiſe is equal to a loud and not very diſtant clap of thunder. If you ſtrike a ſingle note of muſic, you have the ſound gradually aſcending, with a great number of repetitions, till it dies away as if at an immenſe diſtance, and all the while diffuſing itſelf thro' the circumambient air. If a good voice ſings, or a muſical inſtrument is well played upon, the effect is inexpreſſibly agreeable. The *deepeſt*, as well as the moſt *acute tones*, are diſtinctly reverberated, and theſe in regular intervals of time. When a muſical inſtrument is founded, it has the effect of a number of inſtruments of a like ſize ahd kind playing in concert. When a number of different inſtruments in uniſon ſounds the ſame note, a good ear is able to diſtinguiſh the variety of ſound produced by each. A ſingle inſtrument ſounding a particular note, and then inſtantly its fifth, or any other concordant note, the two ſounds can be heard, as it were, running into and uniting with each other in a manner peculiarly agreeable. But the effect of a variety of inſtruments playing in concert is particularly charming, and muſt excite ſuch emotions in the ſoul as it is impoſſible to deſcribe. In this chapel is the monument of Marjory Bruce (A); ſhe was daughter of Robert Bruce, and wife of Walter, great ſteward of Scotland, and mother of Robert II. In this ſame chapel were interred Elizabeth Muir and Euphemia Roſs, both conſorts to Robert II.

A particular account of the abbey of Paiſley would fill many pages. It was founded as a priory for monks of the order of Clugni about the year 1160 by Walter great ſteward of Scotland. It was afterwards raiſed to the rank of an abbacy; and the lands belonging to it were by Robert II. erected into a regality, under the juriſdiction of the abbot. After the Reformation, the abbacy was ſecularized by the Pope in favour of Lord Claud Hamilton, third ſon of the duke of Chatelherault, in reward of his ſteady adherence to the cauſe of Queen Mary; and, in 1588, it was by the king and parliament erected into a temporal lordſhip, and Lord Claud was created Lord Paiſley. The revenues of the abbacy were very conſiderable: They conſiſted of the tythes of 28 different pariſhes, with the property of the lordſhips of Paiſley, of Kilpatrick in Dumbartonſhire, and of Monkton in Ayrſhire, extending each to a hundred merk land; and the forty pound land of Glen in Lochwinnoch; with the lands of Achengown, Grange, &c. and a conſiderable detached property in different parts of the kingdom. All this property, with the patronage of the ſeveral churches, fell to Lord Claud Hamilton, laſt abbot of Paiſley. It continued in that family till 1653, when his grandſon James earl of Abercorn ſold the lordſhip of Paiſley to the earl of Angus, who next year ſold it to William Lord Cochran, Kilpatrick to Sir John Hamiltoun of Orbiſtoun, Monktoun to Lord Bargenny, and Glen to Lord Semple and others. Great part of the lordſhip of Paiſley was at different times ſold off by the family of Dundonald; and what remained of it was in 1764 repurchaſed by the late earl of Abercorn. The fabric of the abbey owed much of its magnificence to Abbot George Schaw, who about 1484 enlarged and beautified the building, ſurrounding the church, the precincts of the convent, the gardens, and a ſmall deer park with a noble wall of hewn free ſtone. The abbey was after the Reformation ſucceſſively the ſeat of the earls of Abercorn and Dundonald. The late earl of Dundonald demoliſhed the ancient gateway; and, by feuing off the immediately adjoining grounds for building, entirely changed the appearance of the place. As it was thus rendered totally unfit for a family reſidence, it has ſince that time been let out into ſeparate dwellings, and is now in a very mean and almoſt ruinous ſtate. The wall ſtood almoſt entire till 1781, when the garden being feued off for building upon by the late earl of Abercorn, the wall was ſold to the feuers, and the ſtones of it employed in their houſes.

The veſtiges of the Roman camp and *prætorium*, at the weſt end of the town, are at preſent almoſt annihilated. It was ſuppoſed to be vaulted underneath.

The number of inhabitants in the town of Paiſley amounted in 1695 to 2200; in 1755 they were 4290; in 1782, 11,100; and in 1792 they were 13,800. At preſent the number of inhabitants in the town and ſuburbs certainly exceeds 20,000.

Paiſley is now the firſt manufacturing town in Scotland, and is greatly celebrated on account of ſome of its branches. The manufactory of ſilk gauze, in this reſpect, firſt claims our notice. This branch is brought here to the utmoſt perfection, and is wrought to an amazing variety of patterns. It has been computed, that there have been no leſs than 5000 weavers employed in Paiſley and in the country adjacent; and the number of winders, warpers, clippers, and others neceſſary in other parts of the ſilk manufacture, has been likewiſe computed to be no leſs than 5000. Each loom will produce in an average value 70l. yearly; the whole will then be 350,000l.

It appears, from the beſt calculation that could be made, that in the year 1784 the manufactures of Paiſley in ſilk gauze, lawn and linen gauze, and white ſewing thread (B), amounted to the value of 579,185l. 16s. 6d. and that no fewer than 26,484 perſons were employed in carrying them on. It is difficult to give an exact account of the ſtate of its manufactures at preſent. The ſilk branch has evidently declined, but the muſlin has ſo far come in its room, and the thread manufacture has conſiderably increaſed. There is, however, reaſon to conclude, that, though it is daily advancing, it has not yet recovered its former greatneſs. Beſides theſe principal manufactures, there are ſome others carried on there of too much importance to be overlooked: for inſtance, conſiderable tan works, four in number, two ſoap and candle works, a manufacture of ribbons, and

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(A) Her ſtory is ſingular: In the year 1317, when ſhe was big with child, ſhe broke her neck in hunting near this place: the Cæſarean operation was inſtantly performed, and the child taken out alive; but the operator chancing to hurt one eye with his inſtrument, occaſioned the blemiſh that gave him afterwards the epithet of *Blear-eye*; and the monument is alſo ſtyled that of *Queen Bleary*. Elizabeth Muir died before the acceſſion of her huſband Robert.

(B) This was introduced into this town about 60 or 70 years ago. A gentleman in this place lately diſcovered the method of making what is called *glazed white thread*, to as great perfection as that made by Mr Leland and Son, London. The value of this branch is computed at about 60,000l. annually.

another of inkle or tape. In 1789 the annual value of all the manufactures in Paiſley of every ſort amounted to 660,385l. 16s.

In the various weaving branches there were employed at Whitſunday 1791, in the ſuburbs of Paiſley, 1108 looms, which, added to 2494 employed in the town, gives 3602 in all. But it is to be obſerved, that the extent to which the weaving branches are carried on by the manufacturers in Paiſley, is not to be judged of from the number of looms in the town and ſuburbs. Beſides about 150 in the country part of the pariſh, there are great numbers employed by them in the villages of Nielſtoun, Barhead, Beith, Dalry, Kilwinning, &c. &c. In 1744, when all the buſineſs was confined to the town and ſuburbs, there were 867 looms at work.—The thread-making in Abbey pariſh employs 9 mills, which, added to 128 employed in Paiſley, makes 137 in all. The number in 1744 was 93. The ſpinning of cotton was introduced into Abbey pariſh in 1783. The principal ſeat of that manufactory is at Johnſtoun, a neat and regularly built village about three miles weſt from Paiſley, upon the eſtate of Mr Houſton of Johnſtoun. The feuing of that village was begun in 1782; and it contained, at Whitſunday 1792, 293 families, or 1434 ſouls. There are five companies eſtabliſhed in it for cotton ſpinning. Two of theſe carry on their principal operations by water machinery. In the two mills employed in them, there are going at preſent 11,672 ſpindles; but, when the whole machinery in both ſhall be completed, there will be 22,572. The number of perſons, young and old, at preſent employed in both mills is 660. There is alſo in the neighbourhood of Paiſley a calico printing work and a copperas work.

The bleaching buſineſs in the Abbey pariſh is carried on to a very conſiderable extent. There are 10 fields for whitening muſlins and lawns, and about as many for thread, almoſt wholly employed by the manufacturers in Paiſley. About 300 perſons are at work in this branch of buſineſs, of whom about 240 are women, who are hired for the ſeaſon. A ſoap and candle manufacture pays about 2000l. of duty *per annum* to government, and has in ſome years paid upwards of 3000l. A black and hard ſoap manufacture, 4500l. *per annum*. The ſtarch manufacture is but lately eſtabliſhed. The diſtillery buſineſs is to be mentioned under this head: it has for ſome time paſt been carried on to a great extent, and the ſpirit manufactured in great perfection. A conſiderable quantity of it is exported, but too much of it is conſumed at home.

The river on which Paiſley ſtands runs from ſouth to north; and falls into the Clyde, after it has joined the conflux of the rivers Grief and Black Cart at Inchinnan bridge, about three miles below the town. At ſpring tides, veſſels of 40 tons burden come up to the quay. The communication by water is of great importance to the inhabitants: for in this way they are frequently ſerved with fiſh of different kinds, and can ſend their goods and manufactures to Port Glaſgow and Greenock, and to Glaſgow likewiſe; and now, by means of the great canal, they have alſo a communication with the frith of Forth.

The air here is moiſt; a neceſſary conſequence of the prevailing ſouth-weſt winds, which, coming loaded with vapour from the Atlantic, produce frequent and heavy rains. The effects of this moiſt atmoſphere appear in rheumatiſms, quinſeys, pneumatic ailments, and all the tribe of inflammatory diſorders. Upon the whole, however, neither the town nor country adjacent can be ſaid to be unhealthy. Contagions, indeed, at times viſit this as other places, which run their uſual courſe as epidemics; but none are remembered of any uncommon violence except a pleuriſy in ſummer 1771, and which, contrary to the received opinion, was truly epidemic. There are no diſorders that can be ſaid to be endemic, unleſs ſcrofula is to be excepted, which is ſtill but too common. This has been aſcribed to the water uſed by the inhabitants of Paiſley: It more probably proceeded from, and certainly was greatly aggravated by, poor living, and by the damp ſhops which were neceſſary for the linen manufacture; for ſince ſilk weaving became the general employment, and increaſe of trade has introduced better living, this diſorder is leſs frequent. From the ſame cauſes probably it is that ſwelled and ſore legs, once extremely common here, are now but rarely met with. Dyſentery raged with great violence in 1765; ſince that time it has been ſcarcely complained of. Nervous fevers at times appear; but they are neither very general nor uncommonly fatal. It is to be apprehended, that the confinement and ſedentary poſture of the weaver, and the laborious life of the bleacher, are frequent cauſes of conſumptive complaints. Intermittents, which, from the damp air, and adjoining moſs, might be expected to be common, are not ſo much as known. W. Long. 4. 20. N. Lat. 55. 52.

PAIX, a town of America, in the iſland of Hiſpaniola, and on the north coaſt. It was built by the French, to whom it is ſubject, and has a pretty good harbour. W. Long. 72. 55. N. Lat. 19. 58.

PAITA, a ſea port of America, in Peru, and in the audience of Quito. The town conſiſts of about 200 houſes but one ſtory high; and the walls are made of ſplit cane and mud, and the roofs only a covering of leaves. The only defence of Paita is a fort without either ditch or out-work; but it is ſurrounded by a brick wall of little or no ſtrength, on which are mounted eight pieces of cannon. It has frequently been plundered by the bucaniers; and Commodore Anſon got poſſeſſion of its fort in 1741, and took and burnt the town becauſe the governor refuſed to ranſom it. W. Long. 81. 19. S. Lat. 6. 12.

PALACE, PALATIUM, a name generally given to the dwelling houſes of kings, princes, and other great perſonages; and taking different epithets, according to the quality of the inhabitants, as *imperial* palace, *royal* palace, *pontifical* palace, *cardinal* palace, *ducal* palace, *epiſcopal* palace, &c.

It is cuſtomary in China to build palaces in honour of great anceſtors. Hu-pi-lay, of the Mogul empire, in the year 1263, built one for his anceſtors; and he is the firſt who borrowed this Chineſe cuſtom. Amongſt the works of the ancient Egyptians, we have an account, in the Ancient Univerſal Hiſtory, of a moſt magnificent palace in the Upper Egypt, not far from Aſwan, the ancient Syrene; the ruins whereof are enough to ſtrike a ſpectator with aſtoniſhment. It is as large as a little city, having four avenues of columns, leading to as many porticoes. At each gate, between two pillars of porphyry, ſtand two gigantic figures of fine black marble, armed with maces. The avenues conſiſt of columns ſet three and three together, in a triangle, on one pedeſtal: on the chapiter of each triangle is placed a ſphinx and a tomb alternately. Every column is 70 feet high, all of one ſtone. There are in all the four avenues about 5000 or 6000 of theſe columns, a great many of which are fallen down.

The firſt hall of this palace is adorned with pieces of hiſtory, which ſeem as freſh as if the painting had not been long finiſhed. In ſome places they have repreſented the hunting of antelopes; in others, feaſts, and a great many young children playing with all kinds of animals. From thence you go into other apartments, incruſted with marble, the roof being ſupported with pillars of porphyry and black marble. Notwithſtanding the vaſt quantity of rubbiſh, our author made ſhift to get up to the top of this building, from whence he had a proſpect of the ruins of the greateſt city that ever had been, as he thought, in the world. He ſuppoſes it might be the ancient Thebes; but that city ſtood much lower.

Lucas, Vol. III.

Palace-Court. See Marshalsea.

PALÆMON, or Melicerta. See Melicerta.

Palæmon (Q. Rhemmius), a famous grammarian of Rome, in the reign of Tiberius. He was born of a ſlave at Vienza. We are told he was firſt brought up in the buſineſs of a weaver: but attending his maſter's ſon to ſchool, he uſed this opportunity to procure knowledge; and acquired ſo much ſkill in the common learning, that he obtained his freedom, and became a teacher or preceptor at Rome. His claim to learning cannot be queſtioned, ſince he is recorded as a ſcholar even by Juvenal:

> *Quis gremio Enceladi doctique Palæmonis affert,*
> *Quantum grammaticus meruit labor?* Sat. 7.

He had alſo an excellent memory, a ready elocution, and could make verſes extempore. On account of theſe qualities, notwithſtanding his debauched courſe of life, which was ſuch that nobody was more unworthy to have the preceptorſhip of youth, he held the firſt rank among thoſe of his profeſſion. But his arrogance ſurpaſſed his merit: he had the confidence to aſſert, that learning was born when he was born, and would die when he died; and that Virgil had inſerted his name in his Eclogues by a certain prophetic ſpirit: for that he, Palæmon, would infallibly become one day ſole judge and arbiter of all poetry. He was exceſſively prodigal for the gratification of his voluptuous humour; inſomuch that neither the immenſe ſums he gained by teaching, nor the great profit he made both by cultivating his lands and in the way of traffic, proved a ſufficient fund to ſupport his extravagancies. We have only ſome fragments of his works.

PALÆOLOGUS (Michael), a very able man who was governor of Aſia under the emperor Theodorus Laſcaris; and who, by various ſtratagems and cruelties, procured the empire for himſelf and his poſterity. See Constantinople, from Nº 145 to the end of that article.

PALÆPAPHOS (Strabo, Virgil, Pliny), a town of Cyprus, where ſtood a temple of Venus; and an adjoining town called *Neo Paphos*; where St Paul ſtruck Elymas blind, and converted the proconſul Sergius Paulus.

PALÆSTRA, in Grecian antiquity, a public building where the youth exerciſed themſelves in wreſtling, running, playing at quoits, &c. To prevent the combatants from hurting themſelves by falling, the bottom of the palæſtra was covered with duſt or gravel. Some will have the palæſtra to be only a part of the gymnaſium. Many authors imagine that the palæſtra was of two kinds; the one for the exerciſe of the body, the other for the cultivation of the mind; but the derivation of the word ſeems to confine it to bodily exerciſe.

We have this account of the palæſtræ in Barthelemi's Anacharſis†: "They are nearly of the ſame form with the gymnaſia. We viſited the apartments appropriated to all the ſpecies of baths; thoſe where the wreſtlers leave their clothes, where they rub their bodies with oil to render their limbs ſupple, and where they roll themſelves in the ſand in order to give their antagoniſts a hold.

"Wreſtling, leaping, tennis, and all the exerciſes of the lyceum, were here repeated before us with greater varieties, and with more ſtrength and ſkill on the part of the performers. Among the different groups before us, we diſtinguiſhed men of the moſt perfect beauty, and worthy of ſerving as models for artiſts: ſome with vigorous and boldly marked outlines, as Hercules is repreſented; and others of a more ſlim and elegant ſhape, as Achilles is deſcribed. The former, devoting themſelves to wreſtling and boxing, had no object but to increaſe their bodily ſtrength; the latter, educated to leſs violent exerciſes, ſuch as running, leaping, &c. confined themſelves to acquirement of agility.

"Their regimen is ſuited to the different exerciſes for which they are deſigned. Some of them abſtain from women and wine; others lead a very abſtemious life; but thoſe who make laborious exertions ſtand in need of a great quantity of ſubſtantial food, ſuch as roaſted beef and pork, to reſtore their ſtrength. If they require only two minæ a-day, with bread in proportion, they give a very favourable idea of their temperance. But ſeveral are mentioned who have made a terrible conſumption of proviſions. Theagenes of Thaſos, for inſtance, is ſaid to have eaten a whole ox in a day. The ſame exploit is attributed to Milo of Crotona, whoſe uſual quantity of food for a day was twenty minæ of meat, as many of bread, and three congii of wine. It is ſaid likewiſe, that Aſtydamas of Miletus, when at the table of Ariobarzanes the Perſian ſatrap, devoured alone the ſupper prepared for nine gueſts. Theſe ſtories, no doubt exaggerated, prove at leaſt the idea generally entertained of the voracity of this claſs of wreſtlers. When they are able to gratify it without danger, they acquire extraordinary ſtrength: their ſtature becomes ſometimes gigantic; and their adverſaries, ſtruck with terror, either decline entering the liſts, or ſink under the weight of their enormous bodies.

"They are ſo oppreſſed by exceſs of nutriment as to be obliged to paſs part of their lives in a profound ſleep, and ſoon become ſo extremely corpulent as to be no longer known to be the ſame perſons: this is ſucceeded by diſorders which render them as wretched as they have always been unſerviceable to their country; for it cannot be denied that wreſtling, boxing, and all thoſe combats diſputed with ſo much fury and obſtinacy in the public ſolemnities, are no longer any thing but oſtentatious exhibitions, ſince tactics have been brought to perfection. Egypt at no time adopted them, as they give only a temporary ſtrength. Lacedæmon has corrected their inconveniences by the wiſdom of her inſtitutions. In the other ſtates of Greece men have diſcovered, that, by ſubjecting their children to them, they incur the riſk of injuring their ſhape and preventing their growth; and that, in a more advanced age, profeſſed wreſtlers never make good ſoldiers, becauſe they are unable to ſupport hunger, thirſt, watching, the ſmalleſt wants, or the moſt trifling deviation from their uſual habits." See PENTATHLUM and PANCRATIUM.

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† Vol. II.

PALÆSTROPHYLAX, was the director of the palæſtra, and the exerciſes performed there.

PALAMBOANG, or PALAMBANG, a town of Aſia, in the Eaſt Indies, and in the iſland of Java, capital of a kingdom; ſeated at the eaſt end of the iſland, on the ſtraits of Bally, and ſeparated from the iſland of Bally by a narrow channel. E. Long. 115. 10. S. Lat. 7. 10.

PALAMEDEA, in ornithology, a genus belonging to the order of grallæ. The character of this genus, according to Latham, is, the bill bends down at the point, with a horn, or with a tuft of feathers erect near the baſe of it; the noſtrils are oval; the toes are divided almoſt to their origin, with a ſmall membrane between the bottoms of each.

Plate CCCLXXIV.

Latham's General Synopſis of Birds.

There are two ſpecies of it; the firſt of which is the palamedea cornuta, or horned ſcreamer. It is about the ſize of a turkey; in length about three feet four inches. The bill is two inches and a quarter long, and black; the upper mandible is a little gibbous at the baſe, the under ſhuts beneath it, as in the gallinaceous tribe: the noſtrils are oval and pervious, and placed near the middle of the bill. From the crown of the head ſprings a ſlender horn of more than three inches in length, and pointed at the end: the irides are the colour of gold: the plumage on the head, neck, and upper part of the body, is black, margined with gray on the firſt, and downy: ſome of the feathers round the neck are likewiſe edged with the ſame: the under parts of the wings are pale rufous, appearing on the ſhoulders and edges of them when cloſed: at the bend of the wing are two ſtrong, ſharp, horny, yellow ſpurs, one above another, the uppermoſt an inch and a half in length: the belly, thighs, and vent, are white: the tail is eight inches and a half long, and black: the legs are ſtout and duſky: the fore claws are moderately bent; the hind one is nearly ſtraight, not unlike that of a lark, and is about an inch long.—The female, we are told, is very like the male.

It is remarked, that they are always met with in pairs; and if one dies, the other mourns to death for the loſs. They frequent places near the water; make a large neſt of mud, in the ſhape of an oven, upon the ground (A); and lay two eggs, the ſize of thoſe of a gooſe. The young are brought up in the neſt till able to ſhift for themſelves. They have but one neſt in a year, which is in January or February, except the firſt eggs are taken away, when they make a ſecond in April or May. The young birds are frequently eaten by the natives, though the colour of the fleſh is very dark; that of the old ones is tough and ill taſted. By ſome authors this ſpecies is ſaid to feed on crabs and birds, ſuch as pigeons, poultry, and even to attack ſheep and goats; but this is denied by others, who ſay that its principal food is reptiles. In the ſtomach of one which M. Bajon diſſected, there were only found herbs and ſeeds of plants; however, he adds, that the bird has no gizzard. The cornuta is a rare ſpecies. It is found in certain diſtricts in Cayenne, Guiana, Surinam, and other parts of South America, chiefly in the marſhes and wet ſavannas, and for the moſt part near the ſea. Theſe ſhould ſeem to be the birds mentioned by Ulloa (B), which are called by the inhabitants of Quito *diſpertadores*, or "awakeners," from their giving notice to others of the approach of danger; as on hearing the leaſt noiſe, or ſeeing any one, though at a great diſtance, they riſe from the ground, and make a loud chattering like a magpie, continuing the noiſe, and hovering over the object which cauſed the alarm, whereby the reſt of the birds, taking the hint, are able in time to eſcape the impending danger. This ſcreaming noiſe, which ſome authors relate as being exceedingly loud and terrible (C), has occaſioned Mr Pennant to give the genus the name annexed to it. In Dr Hunter's muſeum there is a fine ſpecimen of this bird, brought from Cayenne.

The ſecond ſpecies of palamedea is the criſtata, or creſted ſcreamer. This bird is about the ſize of a heron: the bill is ſhort, bent like that of a bird of prey, and of a yellowiſh brown: the irides are gold-coloured: on the forehead, juſt above the bill, is a tuft of black feathers, variegated with aſh-colour: the head, neck, and body, are gray, mixed with rufous and brown, moſt inclining to the laſt on the wings and tail: the wings are not furniſhed with ſpurs: the legs pretty long, of a dull yellow: claws brown; the hind toe placed high up, ſo as not to touch the ground in walking.

This bird inhabits Braſil. Linnæus makes it to belong to the ſcreamer genus, perhaps from its cry; for it is ſaid to be heard at a great diſtance, and is not unlike that of a hen turkey. None of our later writers ſeem to have ſeen it, all of them relying on Marcgrave both for deſcription and figure. It is ſaid to feed on the ſame food as the heron tribe: the fleſh is good, and the bird by ſome kept tame.

PALAMEDES, a Greek chief, ſon of Nauplius king

(A) Authors differ. Bajon ſays, that it makes the neſt both in thickets, at ſome diſtance from the ground, and often among the ruſhes. Fermin tells us, that it builds on high trees. See *Mem. ſur Cay.* and *Deſcr. Surin.*

(B) Voy. Vol. II. p. 243.—Ulloa makes their ſize no bigger than that of a cock. He ſays, that the head is adorned with a tuft of feathers. Perhaps he may mean the next ſpecies.

(C) *Terribile voce clamitans.* Linnæus.

king of Eubœa, by Clemene. He was ſent by the Grecian princes who were going to the Trojan war, in order to bring Ulyſſes to the camp, who, to avoid the expedition, pretended inſanity; and the better to carry on the impoſition, he often harneſſed different animals to a plough, and ſowed ſalt inſtead of barley. Palamedes ſoon diſcovered the cheat. He knew that regret to part with Penelope, whom Ulyſſes had lately married, was his only reaſon for pretending inſanity; and to demonſtrate this, Palamedes took Telemachus, of whom Penelope had lately been delivered, and put him before his father's plough. Ulyſſes turned the plough a different way, not to hurt his child. He was therefore obliged to attend the Greek princes to the war; but a mortal enmity took place between Ulyſſes and Palamedes. The king of Ithaca determined to take every opportunity to diſtreſs him; and when all his expectations were fruſtrated, he was mean enough to bribe one of his ſervants, and to make him dig a hole in his maſter's tent, and there conceal a large ſum of money. After this Ulyſſes forged a letter in Phrygian characters, as from Priam to Palamedes. In the letter the Trojan king ſeemed to beg Palamedes to deliver into his hands the Grecian army, according to the conditions which had been previouſly agreed upon when he received the money. This forged letter was carried, by means of Ulyſſes, before the princes of the Grecian army. Palamedes was ſummoned, and made the moſt ſolemn proteſtations of innocence, but in vain. The money that was diſcovered in his tent ſerved to corroborate the accuſation and he was therefore found guilty by the whole army, and ſtoned to death. Homer is ſilent about the unfortunate fate of Palamedes; and Pauſanias mentions, that it had been reported by ſome that Ulyſſes and Diomedes had drowned him in the ſea as he was fiſhing on the coaſt. Philoſtratus, who mentions the tragical ſtory as above related, adds, that Achilles and Ajax buried his body with great pomp on the ſea ſhore; and that they raiſed upon it a ſmall chapel, where ſacrifices were regularly offered by the inhabitants of Troas. Palamedes was a man of learning as well as a ſoldier; and, according to ſome, he completed the alphabet of Cadmus by the addition of the four letters θ, ξ, χ, φ, during the Trojan war. To him alſo is attributed the invention of dice and backgammon; and it is ſaid that he was the firſt who regularly ranged an army in a line of battle, and who placed ſentinels round the camp, and excited their vigilance and attention by giving them a watchword.

PALARIA, among the Romans, a kind of exerciſe performed at a ſtake by the ſoldiers. The ſtake being fixed in the ground, and ſix feet high above it, the young undiſciplined ſoldiers advanced againſt it, armed with a hurdle and cudgel, inſtead of a ſword and ſhield, and went through all the rules of attack and defence, as if actually engaged with an adverſary. Sometimes they ſtood at a diſtance, and attacked with miſſive weapons; at the ſame time uſing all the requiſite motions for defending themſelves, and warding off what might be thrown againſt them.

PALATE, in anatomy, the fleſh that compoſes the roof, or the upper and inner part, of the mouth.

The palate has much the ſame ſtructure with the gums; but it has alſo a great number of glands, diſcovered ſo early as the time of Fallopius: theſe are principally ſituated in the hinder part near the uvula, where it is pendulous, in the manner of a curtain, which part is called the *velum*, or *clauſtrum*, of the palate. The glands ſituated particularly in this part, ſecrete a mucous fluid, ſerving to lubricate the mouth and throat, and to facilitate deglutition: they have a great number of apertures there for the diſcharge of this humour into the mouth.

The great uſes of this membrane are, to defend the bones of the palate from corrupting; and for preventing, by its clauſtrum or velum, the things to be ſwallowed from getting up into the noſtrils.

PALATINATE, a province or ſigniory, poſſeſſed by a palatine.

Palatinate of the Rhine, a province of Germany, divided into two parts by the Rhine, called the *Upper* and *Lower Palatinate.* The former lies in the circle of Bavaria, and belongs to the elector thereof; but the latter, in the circle we are now treating, belongs to the elector Palatine. The latter part is bounded to the eaſt by the county of Katzenellnbogen, the archbiſhopric of Mentz, the biſhopric of Worms, and part of the territory of the Teutonic order in Franconia; to the weſt by Alſace, the duchy of Deuxponts, the county of Sponheim, the duchy of Simmern, and certain diſtricts of the electorate of Mentz; to the ſouth by the duchy of Wurtemberg and the biſhopric of Spire; and to the north by a part of the archbiſhopric of Mentz and the county of Katzenellnbogen. It contains 41 towns, beſides ſeveral boroughs; and is about 100 miles in length, and 70 in breadth. The air is healthful, and the ſoil fruitful in corn, paſturage, wine, tobacco, and all ſorts of pulſe and fruits, particularly walnuts, cheſnuts, and almonds. This country alſo breeds abundance of cattle, and is well watered by the Neckar, the Nahe, and the Rhine. In the laſt of theſe, near Germerſheim and Selz, is found gold: the excluſive right of ſearching for which is farmed out by the elector. The ſtate of religion hath varied greatly here ſince the Reformation, Lutheraniſm, and Calviniſm having been uppermoſt by turns, till the electorate devolved to the Popiſh branches of the family, when Popery, with all its ſuperſtition and mummery, was eſtabliſhed anew: ſo that the Proteſtant religion is now on a very precarious footing in the Palatinate, though moſt of the natives are ſtill of that perſuaſion: but the two ſects of Proteſtants, namely, the Lutherans and Calviniſts, have greatly contributed to their own ruin, by their mutual jealouſy and animoſity, being no leſs rancorous againſt one another than againſt their common adverſaries the Papiſts. The Lutherans reckon themſelves 50,000 ſtrong, and are poſſeſſed of about 85 churches; but not one half of their preachers and ſchoolmaſters have a competent maintenance. The number of Calviniſt clergy here is eſtimated at 500, and that of the Roman Catholics at 400. Beſides ſchools and Jeſuits colleges in this country, there is one univerſity, namely, that of Heidelberg; but there is very little trade in it except in wine. Authors are divided about the origin of the name *Palatines*, or *Pſalzgraves*, as the Germans call them; but it ſeems moſt likely to be derived from the *palatia*, or palaces, which the old Frankiſh and German kings and Roman emperors were poſſeſſed of in different parts of the country, and over which they appointed ſupreme ſtewards or judges, who are called *Palatines* or *Pſalzgraves*. The countries where theſe Palatines kept their courts, were, from them, called *Palatinates*; which name came at laſt to be appropriated, by way of eminence, to this country, as being the moſt conſiderable of them. The ancient electoral line failing in 1685, the electorate devolved to Philip William duke of Neuburg; and upon the death of his ſecond ſon Charles Philip, to the prince of Sultzbach. This elector has the title of arch-treaſurer of the empire, as well as the elector of Brunſwic Lunenburgh, and is the fifth in rank among the ſecular electors. He is alſo one of the vicars of the empire alternately with the elector of Bavaria, and enjoys many other prerogatives. In his own dominions, he diſpoſes of all vacant benefices; but allows the eccleſiaſtical council, compoſed of two clergymen and two laymen, to preſent two candidates, of which he chooſes one. He is alſo maſter of all the tithes in his dominions; but he either grants them to the clergy, or ſalaries in lieu of them, out of the revenues of the church. His title is Pſalzgrave of the Rhine; arch-treaſurer and elector of the holy Roman empire; duke of Bavaria, Juliers, Cleve, and Berg; prince of Mons; marquis of Bergen-op-Zoom; count of Veldens, Sponheim the Mark, and Ravenſberg; and lord of Ravenſtein. His quota to the army of the empire is 30 horſe and 138 foot, or 914 florins monthly. To the chamber of Wetzlar he contributes, each term, 404 rixdollars, 82 kruitzers. There is an order of knighthood in this country, viz. that of St Hubert; the badge of which is a quadrangular croſs pendant to a red ribbond, with a ſtar on the breaſt. The whole of the elector's revenue, ariſing from the Palatinate, the duchies of Berg and Juliers, the ſeigniory of Revenſtein, and the duchies of Neuburg and Sultzbach, hath been eſtimated at about 300,000l. *per annum*. The military eſtabliſhment conſiſts of ſeveral regiments of horſe and foot, beſides the horſe and Swiſs lifeguards: in time of peace he is ſaid to maintain about 6000 men.—All the different courts and councils, uſual in other countries for the different departments of government, are alſo to be found here.

In general, the Lower Palatinate has ſuffered more by the preceding wars with France than all the provinces of Germany put together during the ſpace of 50 years; for the French have plundered the country, and demoliſhed ſome of its firſt towns more than once. In the modern part of the Univerſal Hiſtory, we have the following account of the riſe of the Palatinate of the Rhine, under the hiſtory of Germany.

"Though Conrad the ſon of Everhard inherited from his father the duchy of Franconia, with the counties of Heſſe and Alſace, he could not ſucceed him in the dignity of Count Palatine, becauſe Otho had taken it from his father, and conferred it on Herman third ſon of Arnold duke of Bavaria: but as this honour was unattended with any ſolid advantage, the emperor began to annex to it the lands and caſtles ſituated on the Rhine, whence he acquired the title of Count Palatine of the Rhine: and, in proceſs of time, theſe counts made great acquiſitions by marriages, purchaſes, mortgages, and imperial donations, ſo as to form a very conſiderable province." The powers of counts palatine in the German empire have always been ample; we have this account of it in the ſame learned work.

"When the counts palatine of the Rhine began to execute their office, they neither poſſeſſed on that river lands, cities, nor caſtles; but having by degrees made great acquiſitions by marriages, purchaſes, agreements, imperial donations, or otherwiſe, they have at length formed a very conſiderable principality. We are told, that under the emperors of the houſe of Suabia, their authority and power increaſed greatly, though it was a gradual increaſe. Under the reign of the emperor Henry IV. the credit of the counts palatine was very conſiderable at the court; and by the German law, the count palatine of the Rhine enjoys not only during the abſence of the emperor, but likewiſe during a vacancy of the empire, the right of the ban beyond the Rhine, to within a mile of the city of Metz, and as far as the ocean, as well as in Flanders. However, this right of the ban has not been granted to him by the emperors. There is likewiſe an ancient ordonnance, in which the office of count palatine is mentioned; it imports, that the count palatine is always by right the repreſentative or lieutenant of the kingdom. Laſtly, How great the power of the counts palatine was, may be underſtood from this, that in the election of Rodolphus of Hapſburgh, and in that of Henry VII. the other electors promiſed to acknowledge as emperor him whom he ſhould name. Although, however, the power of the counts palatine had as it were ſecured to them the vicariate of the empire, nevertheleſs the emperors ſtill reſerved to themſelves the right of eſtabliſhing vicars." See BAVARIA.

PALATINATES *of* POLAND. Previous to the revolution in this unfortunate country, it was divided into palatinates; whether thoſe will be now changed cannot at preſent be aſcertained, though it ſeems likely. A Poliſh palatine is thus deſcribed in the Univerſal Hiſtory:

"A palatine may be regarded as the governor of a province, who levies and leads the troops of his own juriſdiction to join the army of the republic. His civil power is likewiſe conſiderable, as he preſides at the aſſemblies of his palatinate, rates the prices of all commodities and merchandiſe in the province, regulates the weights and meaſures, and judges and defends the Jews within his juriſdiction. This part of his function is particularly ſpecified, that a ſet of men the moſt uſeful and induſtrious in Poland may not be oppreſſed; the king being likewiſe obliged, by his oath, to afford them the protection of the laws and his ſovereignty. Under him is appointed a ſubſtitute or vice-palatine, who takes an oath to his ſuperior, and muſt be poſſeſſed of a land eſtate to a certain value.

PALATINE, or COUNT PALATINE, a title anciently given to all perſons who had any office or employment in the prince's palace: but afterwards conferred on thoſe delegated by princes to hold courts of juſtice in the provinces; and on ſuch among the lords as had a palace, that is, a court of juſtice, in their own houſes.

Counties PALATINE *in England*.—Cheſter, Durham, and Lancaſter, are called *counties palatine*. The two former are ſuch by preſcription, or immemorial cuſtom ; or, at leaſt as old as the Norman conqueſt : the latter was created by King Edward III. in favour of Henry Plantagenet, firſt earl and then duke of Lancaſter ; whoſe heireſs being married to John of Gaunt the king's ſon, the franchiſe was greatly enlarged and confirmed in parliament, to honour John of Gaunt himſelf, whom, on the death, of his father-in-law, the king had alſo created duke of Lancaſter. Counties palatine are alſo called *à palatio;* becauſe the owners thereof, the earl of Cheſter, the biſhop of Durham, and the duke of Lancaſter, had in thoſe counties *jura regalia*, as fully as the king hath in his palace ; *regalem poteſtatem in omnibus*, as Bracton expreſſes it. They might pardon treaſons, murders, and felonies ; they appointed all judges and juſtices of the peace ; all writs and indictments ran in their names, as in other counties in the king's ; and all offences were ſaid to be done againſt their peace, and not, as in other places, *contra pacem domini regis*. And indeed by the ancient law, in all peculiar juriſdictions, offences were ſaid to be done againſt his peace in whoſe court they were tried ; in a court-leet, *contra pacem domini ;* in the court of a corporation, *contra pacem ballivorum ;* in the ſheriff's court or tourn, *contra pacem vicecomitis*. Theſe palatine privileges (ſo ſimilar to the regal independent juriſdictions uſurped by the great barons on the continent during the weak and infant ſtate of the firſt feudal kingdoms in Europe) were in all probability originally granted to the counties of Cheſter and Durham, becauſe they bordered upon enemies countries, Wales and Scotland : in order that the owners, being encouraged by ſo large an authority, might be the more watchful in its defence ; and that the inhabitants, having juſtice adminiſtered at home, might not be obliged to go out of the county, and leave it open to the enemy's incurſions. And upon this account alſo there were formerly two other counties palatine, Pembrokeſhire, and Hexamſhire, the latter now united with Northumberland : but theſe were aboliſhed by parliament, the former in 27 Hen. VIII. the latter in 14 Eliz. And in 27 Hen. VIII. likewiſe, the powers before mentioned of owners of counties palatine were abridged ; the reaſon for their continuance in a manner ceaſing ; though ſtill all writs are witneſſed in their names, and all forfeitures for treaſon by the common law accrue to them.

Of theſe three, the county of Durham is now the only one remaining in the hands of a ſubject. For the earldom of Cheſter, as Camden teſtifies, was united to the crown by Henry III. and has ever ſince given title to the king's eldeſt ſon. And the county palatine or duchy of Lancaſter was the property of Henry of Bolingbroke, the ſon of John of Gaunt, at the time when he wreſted the crown from King Richard II. and aſſumed the title of Henry IV. But he was too prudent to ſuffer this to be united to the crown ; leſt, if he loſt one, he ſhould loſe the other alſo. For, as Plowden and Sir Edward Coke obſerve, "he knew he had the duchy of Lancaſter by ſure and indefeaſible title, but that his title to the crown was not ſo aſſured : for that after the deceaſe of Richard II. the right of the crown was in the heir of Lionel duke of Clarence, ſecond ſon of Edward III. ; John of Gaunt, father to this Henry IV. being but the fourth ſon." And therefore he procured an act of parliament, in the firſt year of his reign, ordaining that the duchy of Lancaſter, and all other his hereditary eſtates, with all their royalties and franchiſes, ſhould remain to him and his heirs for ever ; and ſhould remain, deſcend, be adminiſtered, and governed, in like manner as if he never had attained the regal dignity : and thus they deſcended to his ſon and grandſon Henry V. and Henry VI. ; many new territories and privileges being annexed to the duchy by the former. Henry VI. being attainted in 1 Edward IV. this duchy was declared in parliament to have become forfeited to the crown, and at the ſame time an act was made to incorporate the duchy of Lancaſter, to continue the county palatine (which might otherwiſe have determined by the attainder), and to make the ſame parcel of the duchy : and, farther to veſt the whole in King Edward IV. and his heirs, kings of England, for ever ; but under a ſeparate guiding and governance from the other inheritances of the crown. And in 1 Hen. VII. another act was made, to reſume ſuch part of the duchy lands as had been diſmembered from it in the reign of Edward IV. and to veſt the inheritance of the whole in the king and his heirs for ever, as amply and largely, and in like manner, form, and condition, ſeparate from the crown of England and poſſeſſion of the ſame, as the three Henries and Edward IV. or any of them, had and held the ſame.

The iſle of Ely is not a county palatine, though ſometimes erroneouſly called ſo, but only a royal franchiſe : the biſhop having, by grant of King Henry I. *jura regalia* within the iſle of Ely ; whereby he exerciſes a juriſdiction over all cauſes, as well criminal as civil.

PALATINE Games, in Roman antiquity, games inſtituted in honour of Auguſtus by his wife Livia, after he had been enrolled among the gods. They were celebrated in the palace, from whence the name, and were confirmed by the ſucceeding emperors.

Some authors ſay that theſe games were inſtituted in honour of Julius Cæſar, and others again confound them with the Ludi Auguſtales ; but neither of theſe opinions ſeem to be well ſupported. See AUGUSTALES.

PALATINUS MONS, or *Palatium*, the firſt mountain of Rome, occupied by Romulus, and where he fixed his reſidence and kept his court, as did Tullus Hoſtilius, Auguſtus, and all the ſucceeding emperors: and hence it is that the reſidence of princes is called *palatium*. The reaſon of the name is variouſly aſſigned : ſome ſay it is derived from the goddeſs Pales, or from the Palatini, who originally inhabited the place, or from *balare* or *palare*, the bleatings of ſheep, which were frequent there ; or perhaps from the word *palantes*, wandering, becauſe Evander, when he came to ſettle in Italy, gathered all the inhabitants, and made them all one ſociety. To the eaſt it has Mount Cœlius, to the ſouth the Aventine, to the weſt the Capitoline, and to the north the Forum.—*Palatinus*, the ſurname of Apollo from this place ; where Auguſtus built a temple to that god, adorned with porticoes and a library, valuable for the various collections of Greek and Latin manuſcripts which it contained.

PALATIUM (anc. geog.), a place in the territory of Reate, diſtant from it 25 ſtadia. Dionyſius Halicarnaſſeus reckons it one of the firſt towns of the Aborigines; and from it Varro accounts for the name of the *Mons Palatinus*; namely, that a colony from Palatium ſettled there.

PALATIUM (Pliny), *Pallantium* (Pauſanias), *Pallanteum* (Livy); *Pallanteum* (Solinus). This laſt is the true writing; the great grandfather of Evander, from whom it took its name, being called *Pallas*, not *Palas*; A town of Arcadia, which concurred to form Megalopolis (Pauſanias). From it the *Palatium*, or *Mons Palatinus*, takes alſo its name, according to Virgil and Pliny.

PALATIUM *Diocleſiani*; the villa of Diocleſian, near Salonæ, where he died, (Euſebius). Afterwards called *Spalatum*; which roſe to a conſiderable city from the ruins of Salonæ; ſituated in Dalmatia on the Adriatic. Now *Spalatto*, or *Spalatro*.

PALATIUM *Luculli*, (Plutarch), or *Villa Luculli*; a place between Miſenum and Baiæ in Campania, of wonderful ſtructure. Now in ruins, and called *Piſcina Mirabile*.

PALATO-SALPINGÆUS, } See ANATOMY, *Table*
PALATO-Staphylinus, } *of the Muſcles*, p. 708.

PALE, a little pointed ſtake or piece of wood uſed in making encloſures, ſeparations, &c. The *pale* was an inſtrument of puniſhment and execution among the ancient Romans, and ſtill continues ſo among the Turks. Hence empaling, the paſſing a ſharp pale up the fundament through the body.

PALE, in heraldry. See HERALDRY, p. 446.

PALEARIUS (Aonius), was a man of the greateſt probity, and one of the beſt writers of the 16th century. He gained the eſteem of the men of wit and learning of his time by a noble poem on the immortality of the ſoul. He was appointed profeſſor of polite literature at Sienna; where his tranquillity was diſturbed by conteſts with an envious colleague, and by the malicious aſperſions of his enemies; againſt which, however, his eloquence proved always a ſufficient defence. At laſt he left Sienna, and accepted the invitation of the magiſtrates of Lucca, who gave him ſeveral marks of their eſteem, and ſettled a conſiderable ſtipend upon him. Some years after, he removed to Milan; where he was ſeized by order of Pope Pius V. and carried to Rome. He was convicted of having ſpoken in favour of the Lutherans, and againſt the Inquiſition; and therefore was condemned to be burnt. This ſentence was executed in 1566. He wrote ſeveral pieces in verſe and proſe; of which the one above mentioned is the moſt eſteemed.

PALENCIA, a town of Spain, in the kingdom of Leon, with a rich archbiſhop's ſee. It had an univerſity, but it was removed to Salamanca. It is ſeated in a fertile ſoil, on the river Carion on the frontiers of Caſtile, in W. Long. 3. 7. N. Lat. 42. 10.

PALERMO, a city of Sicily, in the Val-di-Mazara, with an archbiſhop's ſee and a large harbour. "This city (ſays Mr Hill*), which is the capital of Sicily, is of great antiquity; and if a conjecture may be formed from its ancient name *Panormus*, which ſignifies an univerſal harbour, it was formerly in a very flouriſhing condition. By whom it was founded is uncertain, nor have we any authentic accounts of its inhabitants till it became a colony of the Phœnicians, after which it paſſed into the hands of the various nations that became maſters of this iſland. The preſent city principally conſiſts of two wide, uniform, and well built ſtreets, each about a mile in length, croſſing each other at right angles in the centre, where there is a ſmall octagon ſpace, ornamented with four ſtatues." Moſt of the cities of Sicily have ſurnames: Palermo is denominated *the happy*. It has gained this epithet, no doubt, on account of the advantages of its ſituation. It has two harbours: in the one, which is very large, and in which there is a mole 1300 paces in length, ſhips lie at anchor; in the other their cargoes are laden and unladen. Both the harbours open to the weſt: there is alſo a ſuperb quay which extends a mile from weſt to eaſt, in a rectilinear direction, and is called *La Marine*. The proſpect is, on the one ſide, loſt in the wide expanſe of the ocean, and on the other confined by the walls of the city; the walls appear adorned with pilaſters, and crowned with a row of balluſtrades through which the eye diſcovers a long range of palaces. Theſe objects altogether form a delightful ſpectacle. Indeed nothing can be more pictureſque than the bay of Palermo. It forms a large amphitheatre, with the capital of Sicily in the centre; ſurrounded for ſome miles by a moſt delightful country, and encloſed by romantic rocks and mountains. The town was formerly ſurrounded by a ſtrong wall; but the fortifications are now entirely neglected, except towards the ſea, where there are ſtill a few weak works. The quay is the principal public walk here. Palermo is embelliſhed all round with avenues of trees, and has four principal entrances, facing the four cardinal points, which are at the extremities of the two ſpacious ſtreets which croſs each other. The moſt frequented of theſe two ſtreets is called *Caſſero*. It begins where the quay ends, with the north gate called *Porta Felice*, the happy gate; and terminates on the ſouth, at the new gate, which opens on the road to Montreale. Near the laſt of theſe gates, this city, which ſo well merits the attention of a lover of the arts, exhibits a large ſquare, round which ſtand ſome extenſive monaſteries, the palace of the archbiſhop, and the palace of the viceroy. Directly oppoſite to the palace of the viceroy ſtands, on a pedeſtal richly ornamented with a variety of figures, a ſtatue of Philip IV. The ſtatue, the pedeſtal, and the ornaments, are all of marble.

Palermo is quite filled with public monuments, churches, monaſteries, palaces, fountains, ſtatues, and columns. Theſe are not all eminently beautiful; for they have not been all erected under the reign of *good taſte*; but every one of them ſhows that the nation is fond of the arts, and poſſeſſes a genius for decoration. Spring waters are very copious in this city. Not a quarter in Palermo but is liberally ſupplied with fountains, moſt of which are marble, all of them adorned with pieces of ſculpture, and all afford large quantities of water.

The ſituation of this city is truly happy; the ſea, the hills, the lofty mountains, preſent on all ſides beautiful and ſtriking proſpects, which render it one of the moſt favourable ſituations for the genius of the artiſt, whoſe object is to copy the beauty and ſublimity of nature. Freed from the fetters of the Inquiſition, the abolition of which was procured by the marquis of Caraccioli, and from the influence of ſome

through Sicily and Calabria.

other unfavourable inſtitutions, which are rapidly declining, Palermo muſt become one of the fineſt cities in the world; and the iſland of which it is the capital, being all cultivated like a garden, one of the moſt enchanting ſpots on the face of the earth. Nature has denied none of her beſt ſpots to Sicily. It was the benignity of nature, which, in the happy ages of antiquity, when the political circumſtances of the Sicilians were not ſuch as to repreſs their genius, prompted and enabled them to erect ſo many illuſtrious monuments.

“Adjoining to the town, and near the ſea, is a public garden or promenade, planted with orange and lemon trees, formed into arcades, and now loaded with fruit §; the ſtems of the trees ſtand in furrows, and are continually watered by a ſmall ſtream. In the middle is a fountain, on which ſtands a coloſſus of white marble, ſurrounded by four groteſque temples, in two of which are canary birds. Among the oranges is a kind called *ſanguinei* or bloody, which are ſtained in the middle with red, and have uſually the fineſt flavour. Some of the lemons are ſweet, but very flat, taſting like ſugar and water. The citrons grow to an immenſe ſize; the rind, which occupies at leaſt three fourths of the bulk of the fruit, is eaten with ſugar; the juice is ſharper than the ſoureſt lemon. Indian figs in very great abundance grow wild in the fields and hedges, to the height of twelve or fourteen feet; of theſe there are three kinds, one with large ſpines, another with ſmaller, and the third almoſt ſmooth. Their fruit is cooling and delicious, 10,000l. worth of which is ſold annually to the poor people in the neighbourhood of this city. Another plant, very common in this country, is the aloe, which uſually bloſſoms every fifth or ſixth year. Of theſe there are five or ſix ſpecies, which grow moſtly in the hedges, and together with the Indian figs, form a moſt impenetrable fence.

“The palace, which is an indifferent old building, is ſituated in a ſquare, near the ſouth gate of the city, and commands a delightful proſpect of the adjacent country. At the top is an obſervatory, inhabited by an ingenious old prieſt who has been in England, and brought from thence ſeveral aſtronomical inſtruments conſtructed by Ramſden.” Neither the ſtructure, ſituation, nor architectural ornaments of the palace are ſuch as to merit any extraordinary praiſe. It is, like many others an aſſemblage of buildings erected in various ages, as need of accommodation or fancy ſuggeſted; and, of conſequence, it muſt unavoidably be defective in architectural order and beauty. The chapel is the only part of it that merits any attention. It was founded by the Counts Roger, the Norman conquerors of Sicily. Within, it is decorated with beautiful pieces of marble and porphyry, and of Moſaic work in gold and various colours. It is in the ſame taſte with the cathedral of Montreale. It is built on the ſame plan with common churches, only on a ſmaller ſcale. The nave is encircled with pillars; on the right and the left are two narrower openings, called *lateral* or low paſſages: the choir and ſanctuary are at the end of the nave. Among all the pillars which encloſe the nave, it would be hard to find two exactly of the ſame form and workmanſhip. Oppoſite to a channelled column ſtands another on which the graving tool has made no ſuch impreſſions; ſeveral have neither aſtragal, nor baſe, nor ſcale: they are formed of various kinds of marble, and are of different orders and unequal in height. The walls, the arcades, and the arches, are covered with Moſaic work, in gold and colours, repreſenting angels, and male and female ſaints.

Over the entrance into the choir, and fronting the nave, there is an Eternal Father of a huge ſize; the deſign of which has, in all probability, been to impreſs the beholder with a ſufficiently awful idea of the greatneſs of God. Such repreſentations of the deity, however improper, not to ſay impious, occur pretty commonly in the churches of Sicily. The cathedrals of both Montreale and Palermo diſplay the Divine Majeſty with equal dignity. Over the walls of the chapel there are many pieces of granite, porphyry, and ſerpentine, cut into a round, or a ſquare, or ſome other form, and ſet like panes of glaſs. Their edges are encircled with various draughts in gold and colours; decorations unqueſtionably expenſive, as they are indeed very finely executed in their kind. But it is amazing that ſuch irregularity of deſign was admitted in a building of ſuch magnificence and raiſed at ſuch an enormous expence. The pavement of the chapel has been originally laid, and ſtill conſiſts in part of large blocks of tin, porphyry, and ſerpentine. Moſt of theſe are round; ornamented with compartments of draughts, and covered over, as well as the walls, with incruſtations of coloured Moſaic work. The ſeat deſigned for the viceroy is of the ſame kind, and highly ornamented. The candleſtick intended to receive the wax lights at the feſtival of Eaſter is of white marble. All the riches of ſculpture are laviſhed on it with ſuch profuſion as renders it a prodigy of labour; but in a fantaſtic unnatural taſte.

In a long gallery in the palace of the viceroy, ſtand two figures of rams in bronze, concerning which we find the following tradition.—Archimedes is ſaid to have long ago erected in one of the public ſquares of Syracuſe four columns with a brazen ram upon the top of each. He is ſaid to have placed them there in ſuch a poſture, as that ſome one of them always indicated which of the four principal winds was blowing; and it is added, that they were fabricated with ſuch art, that the wind cauſed them to utter ſounds exactly ſimilar to the bleating of ſheep; and whenever any one of the four bleated, he thereby gave notice that the wind was blowing from that quarter towards which he ſtood. It is certain (as travellers inform us) that the two brazen rams in this gallery are perforated with ſmall holes in their flanks, cloſe to their thighs, and in other places over their bodies; and that by blowing through thoſe holes a ſound is produced pretty much like the bleating of ſheep. The wind appears to paſs through the holes, and to iſſue out at the mouth: there might, however, be other holes in the pedeſtal on which the ram ſtood, or in other parts of the body, which might contribute to produce the bleating; for travellers agree in ſaying, that thoſe which they could obſerve do not appear to be ſufficient to produce the effect. The prince of Torre Muzza, one of the moſt enlightened men in Sicily, informed M. Houel, that theſe two rams were dug up from among the ruins of Syracuſe in the fourteenth century: as they were buried under ground, they had probably lain there for many centuries. They were bought by the Marquis Geraci, of the family of Ventimiglia, and lay long in his caſtle. About the end of the fifteenth century they were brought to Palermo, and placed in the palace of the viceroy. It is not known what is become of the other two. They are probably buried in ſome ancient ruins, and may be one day or other diſcovered in digging for the foundation of ſome new building. The proportions of theſe two rams are larger than nature. They are pieces of very fine workmanſhip: both the heads and the horns are formed with taſte, delicacy, and truth; the wool is not ſo well executed; the forms all together are not abſolutely the fineſt that might be ſelected from among the whole ſpecies.

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§ February.

The cathedral of Palermo is dedicated to St Roſalia. The Sicilians, though ſo exceedingly devout, have however neglected to repair it; and it is at preſent in a moſt miſerable ſtate, as the interior parts appear to be falling into ruins. Propoſals have been made for rebuilding it, and various plans have been ſhown.

The preſent church appears to have been built by the Counts Roger. The external parts are in a Gothic taſte, and very heavy: within, it has been at different periods repaired and embelliſhed. The pillars of the nave are adorned with pilaſters of the Corinthian order: theſe are joined by arches through which you paſs to the ſides of the building. In ſome places it is overloaded with ornaments, in others but very poorly ornamented: viewed all together, it is ſo deſtitute of order or proportion as to be abſolutely ridiculous.

In a chapel on one ſide of the cathedral are four Gothic tombs of the ſame period. They have been originally ſarcophagi; and having eſcaped the fate of moſt of the other works of antiquity, have been ſpoiled by attempts to repair or improve them, and have been ſet up here to preſerve the remains of ſome of the kings of Sicily. The only thing about them that can deſerve attention is the beauty of the ſtone; they are of a fine red porphyry.

In the ſame chapel there is a fine large tabernacle; the whole of which, when viewed without diſtinction of the parts, reſembles the dome and the front gate of the Val-de-grace at Paris. It is of rich lapis lazuli, of the very fineſt colour. The whole of it is plated, and the pillars are ſaid to be ſolid. All its ornaments are of gilt braſs; and on the whole it is extremely beautiful.

Around the church are ſeveral ſtatues of ſaints by Guagini, the celebrated ſculptor. On the way from the cathedral down the Caſſero there is, on the right hand, a ſmall ſquare, at the entrance of which ſtands a pedeſtrian ſtatue of Charles V. in bronze. Near the place where the two great ſtreets croſs ſtands the ſenate houſe, in a ſmall court, before which there is a fine marble fountain; there are beſides about this edifice many curious fragments of antiquity. It would extend this article beyond all proportion if we were to mention all the curioſities which are to be found in Palermo. We ſhall now endeavour to give our readers an idea of the internal government of the place, which we ſhall do in the words of Mr Hill.

“The magiſtrates appointed to preſerve the order of ſociety in this city are, firſt, the ſupreme judge, to whom belongs the adminiſtration of juſtice in criminal caſes: he is the head of the nobility, and immediately follows the viceroy in all the ſolemn functions. Secondly, The prætor, who regulates the affairs of the city. He is the perpetual deputy of the kingdom; chief in parliament of the order to whom appertains the right of regulating the king's demeſne, and poſſeſſed of the prerogative of captain-general during the abſence of the viceroy. Thirdly, The prætorian court, which conſiſts of three judges, citizens of Palermo, who are choſen annually by the king. They aſſiſt the ſupreme judge in the deciſion of criminal affairs, and the prætor in the deliberations upon the finances; theſe two officers, however, have neither vote nor ſignature, except the prætor, in the buſineſs reſpecting the public bank and firſt fruits. Fourthly, The ſenate of Palermo, compoſed of the prætor and ſix practitioners of the law, named by the king, who wear the toga after the manner of the ancient Roman ſenators, and principally inſpect the police which regards the grain and proviſions. There are beſides ſeven great officers of ſtate, to each of which is aſſigned a peculiar employment. Firſt, *Il Maeſtro Portolano*, to whom is committed the care of the public granaries, and who manages the ſale of the corn both at home and abroad. The impoſition of a tax upon this commodity has nearly proved the ruin of agriculture, eſpecially as the exportation of it is prohibited to all thoſe who are not able to pay an exorbitant price for that privilege. The quantity of corn annually produced in the iſland does not at preſent amount to more than a tenth part of what was collected in former years. Secondly, The auditor general, who paſſes judgment without appeal upon all offences committed within the precincts of the palace. Thirdly, The high admiral, whoſe juriſdiction extends over the marine. Fourthly, The chancellor, who overlooks all the notaries of the kingdom, prepares all official patents, reads the propoſitions when the parliament aſſembles, and at the time of a coronation tenders the oath of fidelity to the people, and alſo proclaims that of the monarch, who thereby binds himſelf to maintain and defend the privileges of the city of Palermo. The ſame ceremony takes place upon the inſtallation of a viceroy. Fifthly, The prothonotary of the queen's chamber, who has the inſpection of the demeſnes of ſix cities, *viz.* Syracuſe, Lentini, Carlentini, St Filippo, Mineo, and Virini, which were formerly appropriated to the queens of Sicily. Sixthly, The chief ſecretary, who preſides over the officers appointed to receive the taxes and duties in the places of their reſpective juriſdictions. And, ſeventhly, The lieutenant of the royal exchequer, who has the adminiſtration of all effects that have been ſequeſtered or confiſcated.

“Palermo is the principal reſidence of the greater part of the Sicilian nobility; and as it is not the cuſtom for any gentleman to walk in the ſtreets, at leaſt 1000 carriages are ſaid to be kept in the town. They are for the moſt part in the Engliſh taſte, very elegant, ſhown to the greateſt advantage, with beautiful horſes richly capariſoned, and as many footmen in ſplendid liveries as can be crowded together behind. Every evening all the people of rank drive about in this manner on the grand public terrace by the ſea ſide. There are alſo very convenient hackney coaches, covered and open, waiting all day in their reſpective ſtations.”

Palermo.

It is very remarkable, that the dead in Palermo are never buried. Captain Sutherland gives the following account of this circumſtance in his Tour to Conſtantinople. The dead bodies are carried to the Capuchin convent, which is one of the largeſt in Italy; “ where, after the funeral ſervice is performed, they are dried in a ſtove heated by a compoſition of lime, which makes the ſkin adhere to the bones. They are then placed erect in niches, and faſtened to the wall by the back or neck. A piece of coarſe drab is thrown over the ſhoulders and round the waſte; and their hands are tied together, holding a piece of paper with their epitaph, which is ſimply their names, age, and when they died. We of courſe (ſays Captain Sutherland) viſited this famous repoſitory; and it is natural to ſuppoſe that ſo many corpſes would impreſs one with reverence and awe. It was nearly duſk when we arrived at the convent. We paſſed the chapel, where one of the order had juſt finiſhed ſaying veſpers, by the gloomy glimmering of a dying lamp. We were then conducted through a garden, where the yew, the cypreſs, and the barren orange, obſcured the remaining light; and where melancholy ſilence is only diſturbed by the hollow murmuring of a feeble water fall. All theſe circumſtances tuned our minds for the diſmal ſcene which we were going to behold; but we had ſtill to deſcend a flight of ſteps impervious to the ſun; and, theſe at laſt, conveyed us to the dreary manſion of the dead. But (will you believe me?) notwithſtanding the chilling ſcene through which we had paſſed, notwithſtanding our being in the midſt of more than a thouſand lifeleſs bodies, neither our reſpect for the dead, nor for the holy fathers who conducted us, could prevent our ſmiling. The phyſiognomies of the deceaſed are ſo ridiculouſly mutilated, and their muſcles ſo contracted and diſtorted in the drying, that no French mimic could equal their grimaces. Moſt of the corpſes have loſt the lower part of the noſe; their necks are generally a little twiſted; their mouths drawn awry in one direction, their noſes in another; their eyes ſunk and pointed different ways; one ear perhaps turned up, the other drawn down. The friars ſoon obſerved the mirth which theſe unexpected viſages occaſioned; and one of them, as a kind of *memento*, pointed out to me a captain of cavalry, who had juſt been cut off in the pride of his youth: but three months ago, he was the minion of a king—the favourite of a princeſs—Alas! how changed! Even on earth there is no diſtinction between him and the meaneſt beggar. This idea in a moment reſtored my reflection; and I felt with full force the folly of human vanity. I turned to the holy father, who gave me this leſſon. His eyes were fixed on what was once a captain of horſe—I ſaw in them, ‘ Read this, titled pomp, and ſhrink to thy original nothingneſs. Hie thee to my lady's chamber, tell her, though ſhe paint an inch thick, to this muſt ſhe come at laſt—make her laugh at that.’ The relations of the deceaſed are bound to ſend two wax tapers every year for the uſe of the convent; in default of which, the corpſe is taken down and thrown into the charnel houſe. Were it not for the number of vacancies occaſioned by the nonpayment of this ſtipend, the Capuchins would be unable to find niches for the number of men who muſt die every year in ſo populous a city as this. Women are dried as well as the men, but are not expoſed. Nobles are ſhut up in cheſts.”

Pales, Paleſtine.

The number of the inhabitants is above 200,000; and the harbour though very large, is not ſo commodious as might be expected, and the veſſels that ride therein are not always very ſafe. There is a magnificent caſtle built near the ſea ſide, wherein the viceroy reſides ſix months in the year; and his preſence draws a great number of nobility to this place. This city has ſuffered greatly by earthquakes, particularly in 1693; and it was greatly damaged by a fire in 1730, when a magazine of powder was blown up, containing 400 tons. It ſtands in a pleaſant fruitful country, on the north-eaſt coaſt of the iſland, and at the bottom of the gulf of the ſame name. E. Long. 13. 23. N. Lat. 38. 15.

PALES, in Pagan worſhip, the goddeſs of the ſhepherds, to whom they offered milk and honey, in order that ſhe might deliver them and their flocks from wild beaſts and infectious diſeaſes. This goddeſs is repreſented as an old woman. She was worſhipped with great ſolemnity at Rome; and her feſtivals, called *Palilia*, were celebrated on the 21ſt of April, the very day that Romulus began to lay the foundation of the city of Rome; the ceremonies of which conſiſted in burning heaps of ſtraw, and leaping over them. No ſacrifices were offered, but purifications were made with the ſmoke of horſes blood, and with the aſhes of a calf that had been taken from the belly of its mother after it had been ſacrificed, and with the aſhes of beans. The purification of the flocks was alſo made with the ſmoke of ſulphur, of the olive, the pine, the laurel, and the roſemary. Offerings of mild cheeſe, boiled wine, and cakes of millet, were afterwards made to the goddeſs. Some call this feſtival *Parilia, quaſi à pariendo*, becauſe the ſacrifices were offered to the divinity for the fecundity of the flocks.

PALESTINE, in its preſent ſtate, is a part of Aſiatic Turkey, ſituated between 31° 30′ and 33° 20′ north latitude, and between 34° 50′ and 37° 15′ eaſt longitude. It is bounded by Mount Libanus, which divides it from Syria, on the north; by Mount Hermon, which ſeparates it from Arabia Deſerta on the eaſt; by the mountains of Seir and the deſerts of Arabia Petræa, on the ſouth; and by the Mediterranean ſea on the weſt.

This once fertile and happy ſpot was firſt called the land of *Canaan*, or *Chanaan*, from Noah's grandſon. In Scripture, however, it is frequently diſtinguiſhed by other names; ſuch as the *Land of Promiſe*, the *Land of God*, the *Land of Iſrael*, &c. It received the name of *Paleſtine* from the *Paleſtines* or *Philiſtines*, who poſſeſſed a great part of it; and it had the name of *Judea*, or *Judea Paleſtina* from *Judah*, the moſt conſiderable of the twelve ſons of Jacob. The Chriſtians have denominated it the *Holy Land*; partly on account of the many ſingular bleſſings it received from the Divine Providence, and partly on account of its metropolis being made the centre of God's worſhip and his peculiar habitation; but much more for its being the place of our Saviour's birth, the ſcene of his preaching and manifold miracles; eſpecially the place in which he accompliſhed the great work of our redemption. As to the name of *Judea*, it did not begin to receive that till after the return of the Jews from the Babyloniſh captivity, though it had been ſtyled long before the *Kingdom of Judah*, in oppoſition to that of *Iſrael*, which revolted from it under Jeroboam, in the reign of Rehoboam the ſon of Solomon. But after the return, the tribe of Judah, the only one that made any figure, ſettling at Jeruſalem, and in the countries adjacent, quickly gave its name to the whole territory. By profane authors it was called by many different names; ſuch as Syria, Paleſtina Syria, Cœloſyria, Iduma, Idumæa, and Phœnicia or Phœnice; but theſe are ſuppoſed only to have been given out of contempt to the Jewiſh nation, whom they looked upon as unworthy of any other name than what diſtinguiſhed the moſt obſcure parts of the neighbouring provinces.

That part of the country which was properly called the *Land of Promiſe*, was encloſed on the weſt by the Mediterranean; on the eaſt by the lake Aſphaltites, the Jordan, the ſea of Tiberias or of Galilee, and the Samachonite lake; to the north it had the mountains of Libanus, or rather of Antilibanus, or the province of Phœnicia; and to the ſouth, that of Edom or Idumæa, from which it was likewiſe parted by another ridge of high mountains. The boundaries of the other part, which belonged to the two tribes and a half beyond the river Jordan, are not ſo eaſily defined, as well as thoſe of the conqueſts made by the more proſperous kings of the Jews. All that can be ſaid with any probability is, that the river Arnon was the firſt northern boundary on that ſide; and with reſpect to thoſe on this ſide the Jordan, there is a conſiderable diſagreement between the Hebrew and Samaritan verſions of the Pentateuch.

The extent of this country is likewiſe variouſly ſettled by geographers; ſome giving it no more than 170 or 180 miles from north to ſouth, and 140 in breadth where broadeſt, though not much above half that breadth where narroweſt. But from the lateſt and moſt accurate maps, it appears to extend near 200 miles in length, and about 80 in breadth about the middle, and about 10 or 15, more or leſs, where it widens or contracts.

The climate is certainly very happy, its ſituation being neither too far ſouth nor too far north. The longeſt day is not above 14 hours 15 minutes: But the limits of Paleſtine appear ſo ſmall, conſidering that the country is likewiſe interſected by high ridges or mountains, woods, deſerts, &c. that many learned men have been induced to queſtion what we read of its fertility and populouſneſs in former times. It muſt be owned, indeed, that when we compare its ancient and flouriſhing ſtate, when it was cultivated with the utmoſt diligence by perſons well ſkilled in every branch of agriculture, with what it has been ſince the total extirpation of the Jews out of it, and more eſpecially ſince it fell into the hands of the Turks, the contraſt is amazingly great: but when we conſider the many evident cauſes which have contributed to effect this change, and even yet conſider the nature of the country itſelf, we find not the leaſt reaſon to doubt the truth of what the ſacred hiſtorians have related. Moſes deſcribes the richneſs of it in the ſtrongeſt terms, even before the Iſraelites got poſſeſſion of it. It even exceeded the land of Egypt, ſo much celebrated by ancient hiſtorians; eſpecially in the vaſt numbers of cattle which it produced; in the quantity and excellence of its wine, oil, and fruits. With reſpect to the oil and fruits, it is plain, that the olives and oil of Canaan exceeded in goodneſs thoſe of Egypt, ſince the tribes ſent them thither from thence; and as for vines, Herodotus tells us, that the Egyptians had none at all, but ſupplied the want of them by a liquor brewed from barley. The preſents which Jacob ſent to his ſon Joſeph, of honey, ſpices, myrrh, almonds, and other fruits of Paleſtine, ſhow that they muſt have been much better in the land of Judea than in Egypt. The wines of Gaza, Aſcalon, and Sarepta, were famous among the moſt remote nations; though it is allowed, that the wine which was made at and in the neighbourhood of Bethlehem, in great quantities, was equal at leaſt, if not ſuperior, to any of the reſt: and that of Libanus, mentioned by the prophet Hoſea, was no leſs celebrated for its excellent flavour.

Several circumſtances contributed to this wonderful fecundity: ſuch as, the excellent temperature of the air, which was never ſubject to exceſſive heats or colds; the regularity of its ſeaſons, eſpecially the former and latter rain; and the natural fatneſs and fertility of its ſoil, which required neither dunging nor manuring, and could be ploughed with a ſingle yoke of oxen and a ſmall kind of plough; for the ſoil was, and is ſtill, ſo ſhallow, that to have gone deep into it, would rather have endangered than improved the crop. With reſpect to the excellency of its corn, we are told, that the bread of Jeruſalem was preferred above all other; and the tribe of Aſher produced the beſt of both, and in greater quantity than any other tribe; and ſuch plenty was there of it, that, beſides what ſufficed the inhabitants, who made it their chief ſuſtenance, Solomon, we read, could afford to ſend 20,000 cors, or meaſures, of it, and as many of oil, yearly, to Hiram king of Tyre; beſides what they exported into other countries. And we find, even ſo late as King Herod, ſurnamed Agrippa, the countries of Tyre and Sidon received moſt of their ſuſtenance from his tetrarchy.

As to their fruits, the grapes were delicious, finely flavoured, and very large. The palm tree and its dates were in no leſs requeſt; and the plain of Jericho, among other places, was famed for the great plenty and excellence of that fruit; inſomuch, that the metropolis of that territory was emphatically ſtyled *the city of palm trees*. But what both this plain, and other parts of Paleſtine, were moſt celebrated for, was the balſam ſhrub, whoſe balm was eſteemed ſo precious a drug among the Greeks, Romans, Egyptians, and other nations, and is ſtill to this day under the name of *balm of Gilead*. They had likewiſe the greateſt variety of other fruit trees in the higheſt perfection; and which might be, in ſome ſenſe, ſtyled *perpetual*, becauſe they were not only covered with a conſtant verdure, but becauſe the new buds always appeared on the ſame boughs before the old fruit was ripe; and of thoſe buds, which were in too great quantities to be allowed to come to maturity, they gathered enough to make very delightful pickles and ſweetmeats, eſpecially of their citrons, oranges, and apples of paradiſe, which laſt commonly hung by hundreds in a cluſter, and as big as hens eggs, and of an excellent taſte and flavour. Their vines yielded grapes twice, and ſometimes three times, a year, great quantities of which were dried up, and preſerved for uſe, as well as their figs, plums, and other fruits. They had plenty of honey; the very trees diſtilled it; and the rocks yielded it in great quantities: but whether that of the latter kind was there depoſited by the induſtrious bees, or produced ſome other way, is much diſputed by travellers and naturaliſts. They likewiſe cultivated ſugar canes in great abundance; and the cotton, hemp, and flax, were moſtly of their own growth and manufacture, except ſome of a finer ſort, that were brought to them from Egypt, and worn by thoſe of the higher rank. Their vicinity to Libanus made the cedars, cypreſſes, and other ſtately fragrant trees, very common in moſt parts of the land, but more eſpecially in Jeruſalem. Cattle, both large and ſmall, they fed in vaſt quantities; and the hilly countries not only afforded them variety and plenty of paſture, but alſo of water, which deſcended thence into the valleys and low lands, and fertilized them to the degree we have ſeen; beſides ſeveral other rivers and brooks, ſome of the moſt remarkable of which we ſhall ſpeak of in their proper places. But the moſt fertile paſture grounds were thoſe on each ſide the river Jordan; beſides thoſe of Sharon, or Sarona, the plains of Lydda, Jamnia, and ſome others then juſtly famed for their fecundity. As for fiſh, the rivers abovementioned, the lake of Tiberias, and the Mediterranean ſea, afforded, as they do to this day, great plenty and variety. Vaſt quantities were brought to Jeruſalem, on which the inhabitants moſtly ſubſiſted; and hence one of the gates of that metropolis was, according to St Jerome, called the *fiſh gate*. The lake Aſphaltites yielded ſalt in abundance, wherewith to ſeaſon and preſerve their fiſh, which Galen affirms to have been preferable to any other for wholeſomeneſs, digeſtion, and extenuation. In ſhort, the Scripture is ſo pregnant with proofs of the extraordinary richneſs and fecundity of this once happy land, and the vaſt number of people that lived in it, almoſt wholly upon its product, to ſay nothing of the vaſt exports of its corn, wine, oil, raiſins, and other fruits, &c. that a man muſt have taken a ſtrange warp to infidelity, that can call it in queſtion, merely on account of the melancholy and quite oppoſite figure it now makes under its preſent tyrannical government.

But its fertility has been called in queſtion; and Voltaire and other infidel writers have raiſed difficulties and objections againſt the authority of Scripture, from the pretended ſterility of the land of Judea. In anſwer to which, the Abbé Guenée, about the year 1780, communicated to the Academy of Inſcriptions and Belles Lettres at Paris, *Two Memoirs concerning the Fertility of Paleſtine*, in order to ſhow that ſuch objections had no ſolid foundation.

In the firſt of them, the author proves, that from the captivity of Babylon to the war of Adrian, Judea was always conſidered as a rich and fertile country. The poſitive and multiplied authorities of the writers of that period, Jews, Greeks, and Romans, not only atteſt in general the fertility of that country, but many of theſe writers, entering into a particular detail of circumſtances, prove it from the nature of the climate, the qualities of the ſoil, and the excellencies and variety of its productions. Theſe are confirmed [illegible] of another kind, but which are of a very convincing nature, even thoſe reſulting from a great number of medals ſtruck under the reigns of the kings of Syria and Judea, and under the Romans, both by Jews and Pagans, and which all bear the ſymbols of a rich fertility. To theſe proofs are added a multitude of facts, recorded in the hiſtory of the Jews during this period; the efforts of the neighbouring kings to conquer their country; the long and bloody wars that the Jews carried on with vigour, and ſometimes with ſucceſs, againſt powerful princes and nations; the tribute and taxes they paid to the kings of Egypt and Syria, to the Romans, and to their own princes; the magnificence of their ſovereigns, and among others of Herod; the troops he raiſed and kept on foot; the temples, fortreſſes, palaces, and cities, which he erected and embelliſhed, not only in his own country, but alſo in Syria, Aſia Minor, and even in Greece; the immenſe ſums he laviſhed among the Romans, the donations he made to his own people, and the vaſt treaſures which he left behind him: all theſe circumſtances concur in proving the fertility and riches of Paleſtine during that period.

In the ſecond memoir, the Abbé Guenée conſiders the ſtate of Paleſtine as it was from the time of the emperor Adrian to the caliphate of Omar, which comprehends a period of four centuries. From ſundry facts he ſhows, that it could not then have been the barren country which it has been repreſented by ſome ſceptical writers. He particularly mentions the project formed by Adrian of rebuilding and embelliſhing Jeruſalem, of forming it into a Roman colony, and giving it his own name; a project of which he could never have entertained a thought, if Judea, which he had ſeen and examined with his own eyes, had appeared to him ſuch a barren and wretched country, as it is ſaid to be by ſome who have neither ſeen that country nor examined the matter with care and attention. Our author alſo produces a variety of other facts, to ſhow that Judea, after all that it had ſuffered from the deſolations of war both in ancient and latter times, ſtill remained at the period in queſtion fertile, rich, and populous. This is the idea which the writers of the time, Pagan and Chriſtian, as well as Jewiſh, have given of Paleſtine. Antoninus Martyr, a citizen of Placentia, who in the 6th century travelled to Paleſtine, and compoſed an account of his voyage, which is ſtill extant, ſays, that the canton of Nazareth was not inferior to Egypt in corn and fruits; and that though the territory of that city was not very extenſive, it abounded in wine and oil, and excellent honey. The country about Jericho appeared to him ſtill more fertile. He ſaw Mount Tabor, which he repreſents as ſurrounded with cities: and he obſerved, in the neighbourhood of Jeruſalem, vineyards, great plantations of fruit trees, and through the whole country a conſiderable number of hoſpitals, monaſteries, and beautiful edifices. Our learned abbé, in concluding his work, acknowledges, that the opulence and fertility of Judea might begin to diminiſh towards the middle of the period treated of in his ſecond memoir: but he does not think that any argument can be drawn from hence againſt its having been at the commencement of this period in a flouriſhing ſtate; and much leſs can any proof be brought from hence, that in preceding periods,

riods, under the kings, or under the adminiſtration of Moſes, the country of Paleſtine was a barren and uncultivated diſtrict.

Beſides, it ought to be conſidered, that it was then inhabited by an induſtrious people, who knew how to improve every inch of their land, and had made even the moſt deſert and barren places to yield ſome kind of productions, by proper care and manure: ſo that the very rocks, which now appear quite bare and naked, were made to produce corn, pulſe, or paſture; being, by the induſtry of the old inhabitants, covered with mould, which, through the lazineſs of the ſucceeding proprietors, has been ſince waſhed off with rains and ſtorms. We may add, that the kings themſelves were not above encouraging all kinds of agriculture, both by precept and example; and, above all, that they had the divine bleſſing promiſed to their honeſt endeavours and induſtry: whereas it is now, and hath been long ſince, inhabited by a poor, lazy, indolent people, groaning under an intolerable ſervitude and all manner of diſcouragements; by which their averſion to labour and agriculture, farther than what barely ſerves to ſupply their preſent wants, is become in a manner natural and invincible. We may farther obſerve, after the judicious Mr Maundrell, that there is no forming an idea of its ancient flouriſhing ſtate, when under the influence of heaven, from what it is now under a viſible curſe. And, if we had not ſeveral concurring teſtimonies from profane authors, who have extolled the fecundity of Paleſtine, that ſingle one of Julian the Apoſtate, a ſworn enemy to Jews and Chriſtians, as well as to all the ſacred writings, would be more than ſufficient to prove it; who frequently makes mention, in his epiſtles, of the perpetuity, as well as excellence and great abundance, of its fruits and product. The viſible effects of God's anger, which this country has felt, not only under Titus Veſpaſian (when myriads of inhabitants were either ſlain, or periſhed by the moſt ſevere famine, peſtilence, and other calamities, and the reſt ſold for ſlaves into all lands; and new colonies ſent to repeople it, who found it in ſuch a deſolate ſtate, as quite diſcouraged them from reſtoring it to its priſtine fruitfulneſs); but much more ſince that emperor's time, in the inundations of the northern barbarians, of the Saracens, and of the more cruel and deſtructive Chriſtians during the cruſades; and in the oppreſſion it now feels under the Turkiſh yoke; may be eaſily owned to be more than ſufficient to have wrought the diſmal change we are ſpeaking of, and to have reduced the far greater part into a mere deſert.

Nevertheleſs, if we may credit thoſe who have viewed it in this doleful condition, they will tell us, there are ſtill ſuch viſible ſigns of its natural richneſs and fertility, as plainly ſhow, that the bare want of culture is the main if not the only cauſe of its preſent poverty and barrenneſs. We ſhall hint, as a farther proof of this, what a learned traveller hath lately written of it from his own obſervations.

"The Holy Land (ſays Dr Shaw), were it as well peopled and cultivated as in former times, would ſtill be more fruitful than the very beſt part of the coaſt of Syria and Phœnice; for the ſoil is generally much richer, and, all things conſidered, yields a preferable crop. Thus the cotton that is gathered in the plains of Ramah, Eſdraelon, and Zabulun, is in greater eſteem than what is cultivated near Sidon and Tripoli. Neither is it poſſible for pulſe, wheat, or any ſort of grain, to be more excellent than what is ſold at Jeruſalem. The barrenneſs, or ſcarcity rather, which ſome authors may, either ignorantly or maliciouſly, complain of, doth not proceed from the incapacity or natural unfruitfulneſs of the country, but from the want of inhabitants, and the great averſion there is to labour and induſtry in thoſe few who poſſeſs it. There are, beſides, ſuch perpetual diſcords and depredations among the petty princes who ſhare this fine country, that, allowing it was better peopled, yet there would be ſmall encouragement to ſow, when it was uncertain who ſhould gather in the harveſt. Otherwiſe, the land is a good land, and ſtill capable of affording its neighbours the like ſupplies of corn and oil which it is known to have done in the time of Solomon."

And Volney, in his Travels in Egypt and Syria, obſerves, that though the whole of Paleſtine is almoſt an entire level plain, without either river or rivulet in ſummer, and only watered by the winter torrents, the ſoil is yet good, and may even be termed fertile; ſo when the winter rains do not fail, every thing ſprings up in abundance; and the earth, which is black and fat, retains moiſture ſufficient for the growth of grain and vegetables during the ſummer. More doura, ſeſamum, water melons, and beans, are ſown here than in any other part of the country. They alſo raiſe cotton, barley, and wheat; but though the latter be moſt eſteemed, it is leſs cultivated, for fear of too much inviting the avarice of the Turkiſh governors and the rapacity of the Arabs.

Judea, in its largeſt ſenſe, was divided into maritime and inland, as well as into mountainous and champain; and again ſubdivided into Judea on this ſide, and Judea beyond Jordan. But the moſt conſiderable diviſion is that which was made among the twelve tribes, by lot, to prevent all murmuring and diſcontent among that ſtubborn people †; of theſe, two and a half were ſeated beyond Jordan, and the reſt on this ſide. The next remarkable diviſion was made by King Solomon, who divided his kingdom into twelve provinces or diſtricts, each under a peculiar officer; and every one of theſe was to ſupply the king with proviſions for his houſehold in his turn; that is, each for one month in the year ‡. But the moſt fatal diviſion of all was that which obtained under his imprudent ſon Rehoboam; when ten of the twelve tribes revolted, under the conduct of Jeroboam, who became head of this new monarchy, ſtyled *the kingdom of Iſrael*, in oppoſition to that of *Judah*, the title which diſtinguiſhed the maimed kingdom of Rehoboam from that time downwards. Under the ſecond temple the diſtinction laſted a conſiderable time, and the ſame bloody hatred and hoſtilities continued between theſe two kingdoms; that of Iſrael taking the name of *Samaria* from its capital. The inhabitants were a mixture of the old Iſraelites, and of new colonies ſent thither by the kings of Aſſyria after their conqueſt of it, till they were ſubdued by the Maccabees, and their metropolis deſtroyed. Under the Romans it began to be divided into tetrarchies and toparchies: the larger were thoſe of Judea, Samaria, and Galilee, Upper and Lower; the leſſer, thoſe of Geraritica, Sarona, and others of leſs note;

Volney's Travels, Vol. II.

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† Joſh. xiv. 2. &c.

‡ 1 Kings iv. 7. &c.

all which lay on this ſide of the Jordan. The reſt, on the other ſide, were thoſe of Gilead, Peræa, Gaulonitis, Auranitis, Batanea, and Decapolis. Joſephus mentions † another diviſion made in Gabinius's time into five diſtricts, or, as he ſtyles them, *συνεδρια* or *councils*, agreeable to the Roman manner: theſe were Jeruſalem, Jericho, and Sephoris on this ſide Jordan; and Gadaris and Amathus on the other. In the reigns of the Chriſtian emperors, it was divided afreſh into Paleſtina Prima, Paleſtina Secunda, and Paleſtina Tertia or Salutaris; which laſt included the far greater part, if not the whole country, as is known to all who are acquainted with hiſtory. On that account we ſhall wave all other diviſions and changes that happened to it under the northern barbarians, Saracens, &c. and conclude this article with the preſent ſtate and diviſion of it under the Turks.—The whole country of Palaſtine is now reduced to a diſtrict or province, under the beglerbegate or baſſaſhip of Scham or Damaſcus, who hath the ſeven following ſangiacs or ſubgovernors under him, ſtyled, according to the different places of their reſidence, 1. The ſangiac of Damaſcus, who is under the baſha of that province; 2. Of Jeruſalem, or, as the Turks call it, *Cudjembaric* or *Coudſcherif*; 3. Aglum; 4. Bahara; 5. Sciſat; 6. Gaza; 7. Nabolos. Each of theſe has a number of ziamets, and each ziamet a number of timariots under them; for the better underſtanding of which terms, we ſhall refer our readers to Sir Paul Ricaut's account of the Ottoman empire. At preſent it will be ſufficient to ſay of theſe inferior ſubdiviſions, under the ſangiac of this diſtrict, or ſangiacate of Jeruſalem, that it hath nine of the former and ſixteen of the latter claſs. Neither muſt the reader imagine theſe ſangiacates or ſub-governments to be any thing conſiderable, or the reſidence of theſe officers to be places of any note or opulence. The former indeed live by oppreſſing the people under them, and extort contributions of every thing that comes within their reach, ſuch as the protection of travellers, merchants, and caravans; but being all under their reſpective baſhas, who are ſtill more griping than their underlings, they are commonly fleeced of ſome conſiderable part of their unjuſt gains. As for the places of their reſidence, except it be here and there one in a conſiderable city, as at Damaſcus and Jeruſalem, the reſt are either ſome old cities or even inconſiderable villages.

There are a variety of curioſities in Paleſtine both natural and artificial; but they are ſo very numerous as almoſt to preclude deſcription: we therefore refer our readers to the Ancient Univerſal Hiſtory, Vol. II. where they are mentioned and particularly deſcribed. The principal mountains, rivers, and other places of note, have already been, or will be, noticed under their reſpective names.

PALESTRINA, a town of Italy, in the Campagna di Roma, with a biſhop's ſee. It is the capital of a principality of the ſame name, and the biſhop is one of the ſix cardinal biſhops. It was anciently famous for the temple of Fortune, being then called *Præneſte*, and ſeated on the top of a mountain, the ruins of which may yet be ſeen. E. Long. 12. 55. N. Lat. 41. 51.

PALESTRINA, is one of the largeſt and moſt populous of the iſlands called the Lagunes near Venice, and where the moſt conſiderable of the noblemen have houſes of pleaſure. It is 15,000 paces in length and 400 in breadth; the principal harbour has alſo the ſame name.

PALFIN (John), an eminent ſurgeon, anatomiſt, and reader in ſurgery at Ghent, the place of his birth; acquired great reputation by his learning and works. The principal of theſe are, 1. A Treatiſe on Oſteology, in 12mo, Paris, 1731. 2. Anatomy of the Human Body, in 2 vols. 8vo, Paris, 1734. He died at Ghent at a great age, in 1730.

PALFREY, is one of the better ſort of horſes uſed by noblemen or others for ſtate; and ſometimes of old taken for a horſe fit for a woman to ride. Camden ſays, that William Fauconberge held the manor of Cukeny, in the county of Nottingham, in ſerjeantry, by the ſervice of ſhoeing the king's palfrey when the king ſhould come to Mansfield.

PALICAUD, or PALGATCHERRY, a fortreſs of conſiderable ſtrength in India, which commands the paſſage between the two coaſts of Malabar had Coromandel, by way of the Tritchinopoly and Coimbettore countries: there is alſo a communication with it thro' the Nayre country. It is in the hands of the Engliſh; and is of great importance to them, becauſe, as Coimbettore is in the hands of Tippoo, by our holding this place on the weſt, and Dindigul on the eaſt of Coimbettore, the province is rendered of little uſe to Tippoo in time of war, unleſs he keeps a very large force there to protect it. See Memoir of a Map of the Peninſula of India by Major Rennel.

PALICATE, a ſea port town of India, on this ſide of the Ganges. It is is ſeated on the coaſt of Coromandel, in the kingdom of Carnate, 70 miles north of Fort St George. Here the Dutch have a factory, and fort called the *Fort of Guelderland*. E. Long. 80. 1. N. Lat. 13. 34.

PALICI, or PALISCI (fab. hiſt.), two deities, ſons of Jupiter by Thalia, whom Æſchylus, according to Macrobius, calls *Ætna*, in a tragedy which is loſt. The nymph Ætna, when pregnant, begged Jupiter to remove her from the purſuit of Juno. Upon which he concealed her in the bowels of the earth; and when the time of her delivery arrived, the earth opened and brought into the world two children, to whom were given the name of *Palici*, *απο του παλιν ικεσθαι*, *becauſe they came again into the world from the bowels of the earth.* Theſe deities were worſhipped with many ceremonies by the Sicilians; and near their temple were two ſmall lakes, which were ſuppoſed to have ſprung out of the earth when they were born. Near theſe pools it was uſual to take the moſt ſolemn oaths when any body wiſhed to decide controverſies and quarrels. If any of the perſons who took the oaths were perjured, they were immediately puniſhed ſupernaturally; and thoſe whoſe oath, by the deities of the place, was ſincere, departed unhurt. The Palici had alſo an oracle, which was conſulted upon ſome great emergencies, and which rendered the trueſt and moſt unequivocal anſwers. In a ſuperſtitious age, the altars of the Palici were ſtained with the blood of human ſacrifices; but this barbarous cuſtom did not laſt long, as the deities were ſatisfied with the uſual offerings.

PALINDROMUS, a verſe or ſentence which runs the ſame when read either backwards or forwards. Such is the verſe,

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† *Ant'q* lib xiv.

Roma tibi ſubito motibus ibit amor.

Some people of leiſure have refined upon the Palindromus, and compoſed verſes, each word of which is the ſame backwards as forwards; for inſtance, that of Camden:

Odo tenet mulum, madidam mappam tenet Anna.
Anna tenet mappam madidam, mulum tenet Odo.

PALINGENESIA, among divines, the ſame with regeneration. Among chemiſts, it denotes the producing of a body from its principles.

PALINGENIUS (Marcellus), well known by a poem divided into 12 books, and entitled *Zodiacus Vitæ*, which he was ſeveral years in compoſing, and dedicated to Hercules II. of Eſte, duke of Ferrara. Some ſay he was phyſician to that prince: others rank him among the learned Lutherans, to whom the ducheſs of Ferrara gave a reception in her court, and honoured with her protection. His *Zodiac* contains good things, and is a philoſophical ſatire againſt immorality and falſe prejudices. Though this poem has borne a multitude of impreſſions, the author's life is but little known. He died ſome time between the years 1537 and 1543.

PALINODY, a diſcourſe contrary to a preceding one: hence the phraſe of *palinodiam canere* was taken for a recantation.

PALINURI PROMONTORIUM (Virgil, Velleius), with a cognominal port, was ſituated at the ſouth extremity of the Sinus Pæſtanus on the coaſt of Lucania: ſo called from Palinurus, Æneas's ſteerſman, who there periſhed (Mela, Dionyſius Halicarnaſſeus).

PALINURUS (fab. hiſt.), Æneas's pilot, whoſe fate Virgil very particularly deſcribes. He fell into the ſea when aſleep; and was three days expoſed to the tempeſts and its agitation, and at laſt came ſafe aſhore, where the cruel inhabitants of the place murdered him to get his clothes. His body was left unburied on the ſea ſhore: and ſince, according to the religion of the old Romans, no one could croſs the Stygian lake before 100 years were elapſed, if his remains had not been decently buried, we find Æneas, when he went down to hell, ſpeaking to Palinurus, and aſſuring him, that though his bones were deprived of a funeral, yet the place where his body was expoſed ſhould ſoon be adorned with a monument, and bear his name; and accordingly a promontory was called *Palinurus*.

PALISADES, in fortification, ſtakes made of ſtrong ſplit wood, about nine feet long, ſix or ſeven inches ſquare, three feet deep in the ground, in rows about two and a half or three inches aſunder, placed in the covert way, at three feet from, and parallel to, the parapet or ſide of the glacis, to ſecure it from ſurpriſe. They are alſo uſed to fortify the avenues of open forts, gorges, half moons, the bottoms of ditches, and in general all poſts liable to ſurpriſe. They are uſually fixed perpendicularly, though ſome make an angle inclining towards the ground next the enemy, that the ropes caſt over them to tear them up may ſlip off.

Turning PALISADES; an invention of M. Coehorn, in order to preſerve the paliſades of the covert way from the beſiegers ſhot. They are ſo ordered, that as many of them as ſtand in the length of a rod, or about ten feet, turn up and down like traps, ſo as not to be in ſight of the enemy till they juſt bring on their attack; and yet are always ready to do the proper ſervice of paliſades.

PALISSE, in heraldry, a bearing like a range of paliſades before a fortification, repreſented on a feſſe, riſing up a conſiderable height, and pointed a-top, with the field appearing between them.

PALIURUS, in botany. See RHAMNUS.

PALL, in heraldry, a figure like a Greek Υ, about the breadth of a pallet; it is by ſome heralds called a *croſs pall*, on account of its being looked upon as an archiepiſcopal bearing.

PALLA, in Roman antiquity, a mantle which women wore over the gown called *ſtola*. It was borne on the left ſhoulder; whence paſſing to the other ſide, under the right arm, the two ends were bound under the left arm, leaving the breaſt and arm quite bare. It had a great many folds, and derived its name from παλλω, to *ſhake* or *tremble*.

PALLADIO (Andrea), a celebrated Italian architect of the 16th century, was a native of Vicenza in Lombardy, and the diſciple of Triſſin. He made exact drawings of the principal works of antiquity to be met with at Rome, adding commentaries to them, which went through ſeveral impreſſions. But this, though a very uſeful work, was greatly exceeded by the Treatiſe of Architecture in four books, which he publiſhed in 1570. Inigo Jones wrote ſome excellent remarks on it; which were included in an edition of Palladio, publiſhed by Leoni, in two vols. folio, 1742.

PALLADIUM, in antiquity, a ſtatue of the goddeſs Pallas. It was about three cubits high, and repreſented the goddeſs ſitting and holding a pike in her right hand, and in her left a diſtaff and a ſpindle. It fell down from heaven near the tent of Ilus, as he was building the citadel of Ilium. Some, however, ſuppoſe, that it fell at Peſſinus in Phrygia; or, according to others, Dardanus got it as a preſent from his mother Electra. There are ſome who maintain, that the palladium was made with the bones of Pelops by Abaris; but Apollodorus ſays, that it was no more than a piece of clock work which moved of itſelf. However various the opinions of ancient authors be about this celebrated ſtatue, it is univerſally allowed, that on its preſervation depended the ſafety of Troy. This fatality the Greeks, during the Trojan war, were well aware of; and therefore Ulyſſes and Diomedes were commiſſioned to ſteal it. This they effected; and if we can rely upon the authority of ſome, they were directed how to carry it away by Helenus a ſon of Priam, who in this betrayed his country, becauſe his brother Deiphobus, at the death of Paris, had married Helen, of whom he was enamoured. Minerva was enraged at the violence offered to her ſtatue; and, according to Virgil, the palladium itſelf ſeemed to have received life and motion; and by the flaſhes which ſtarted from its eyes, and ſudden ſprings from the earth, it ſeemed to ſhow the reſentment of the goddeſs. The true palladium, as is obſerved by ſome, was not carried away from Troy by the Greeks, but only a ſtatue of ſimilar ſize and ſhape, which was placed near it, to deceive whatever ſacrilegious perſons attempted to ſteal it. The palladium, therefore, as they maintain, Æneas conveyed ſafe from Troy to Italy, and it was afterwards preſerved by the Romans with the greateſt ſecrecy and veneration in the temple of Veſta; a circumſtance which none but the veſtal virgins knew. It was eſteemed the deſtiny of Rome; and there were ſeveral others made perfectly like to it, to ſecure it from being ſtolen, as was that at Troy, which the oracle of Apollo declared ſhould never be taken ſo long as the palladium was found within its walls. A palladium was alſo placed by Nicias in the citadel of Athens.

PALLADIUS, biſhop of Helenopolis in Bithynia, and then of Aſpona. He was a Galatian, and born at Cappadocia He became an anchorite in the mountain of Nebria in 388, and was conſecrated a biſhop in 401. He was an intimate friend of St John Chryſoſtom, whom he never forſook during the time of his perſecution, nor even in his exile. He went to Rome ſome time after Chryſoſtom's death, and at the requeſt of Lauſus governor of Cappadocia, compoſed the Hiſtory of the Anchorites or Hermits, and entitled it *Lauſiaca*, after the name of that lord, to whom he dedicated it in 420, when it was written, being then the 20th year of his epiſcopacy, and 53d of his age. Palladius was accuſed of being an Origeniſt. It is true, he was an enemy to St Jerome, of whom he does not ſpeak well, and was intimately connected with Ruffinus; but perhaps no good proof can be brought of his Origeniſm. He had been the diſciple of Evagrias of Pontus, and was even ſuſpected of entertaining the ſentiments of Pelagius. He died in the 5th century, but in what year is not certain. His Hiſtory was publiſhed in Greek by Meurſius at Amſterdam in 1619, and in Latin in the *Bibliotheca Patrum*: but he ſeems not to have been the writer of the Life of St John Chryſoſtom, in Greek and Latin by M. Bigot, printed in 1680.

PALLAS, a freed man of Claudius, celebrated for the power and the riches which he obtained. He adviſed the emperor his maſter to marry Agrippina, and to adopt her ſon Nero for his ſucceſſor. It was through him and Agrippina that the death of Claudius was haſtened, and that Nero was raiſed to the throne. Nero, however, forgot to whom he was indebted for it. He diſcarded Pallas, and ſome time after cauſed him to be put to death, that he might procure his great riches.

PALLAVICINI (Ferrante), an Italian wit of conſiderable note, was deſcended from a branch of a noble family ſeated in Placentia, where he was born about the cloſe of the 16th century. He ſoon gave great proofs of an extraordinary genius, and quickly acquired a maſterly knowledge in the elements of claſſical erudition. He was afterwards ſent to complete his education in the monaſtery of Auguſtin friars at Milan, where he took the habit, lived much eſteemed, improved himſelf in piety as well as learning, and raiſed great expectations of future fame; but being ſomewhat amorouſly inclined, he engaged in an intrigue with a young courtezan of Venice, whoſe charms proved irreſiſtible; and in order to enjoy them without reſtraint, he obtained leave from his general to make the tour of France. Accordingly, he pretended to ſet out for that country; but it was only a blind to cover his real deſign. He never left Venice, but lived there privately, enchanted in the arms of his Venus: and having too ready a talent at invention, he impoſed upon his friends by often ſending them in letters feigned accounts of his travels through France; alſo informing them of ſeveral things reſpecting that court, which he learned from the advices of many conſiderable perſons with whom he correſponded.

His money in the mean time flew with expanded wings, and he ſoon found his purſe much drained. In this exigence he naturally had recourſe to his wits for ſupplies. He wrote for the bookſellers; and compoſed ſeveral pieces, more for the ſake of lucre than out of fondneſs for authorſhip. Among other things, he wrote a collection of letters, moſtly ſatirical, which he called *The Courier Robbed of his Mail.* The work appeared at firſt in ſuch a caſt, as could not give great offence except to the Spaniards, againſt whom he had ſome grudge. The piece was accordingly licenſed by the inquiſitors; but falling into the hands of the ſecretary of the republic of Venice, who at that time was licenſer of books, he would not give his imprimatur, though great intereſt was employed for that purpoſe, neither would he return the manuſcript. This enraged Pallavicini ſo much, that had not his friends reſtrained him, he would have purſued the affair to his ruin.

At length he found an opportunity of travelling into Germany with the duke of Amalfi as his chaplain. This journey, as was to be expected, had no good effect either upon his wit or his morals. On the contrary, finding himſelf, from the manners of the Germans, more at liberty, he indulged his genius and paſſions with greater eaſe; and after a reſidence there of upwards of a year with the duke, he returned to Venice, with a face marked all over with blotches like the evil, and a ſpirit reſolved to ſacrifice to his reſentment at the riſk of his life. He was reſolved to have his full meaſure of revenge againſt the ſecretary of the republic for keeping his manuſcript; and with him his reſentment joined the family of Barberini, Pope Urban VIII. and his nephews, becauſe they alſo endeavoured, at the inſtigation of the Jeſuits, to get all his manuſcripts forbid the preſs. In this rancorous ſpirit he caſt his Courier into a new model, and enlarged it with many letters and diſcourſes. Thus new modelled, he offered it to a bookſeller, who undertook to get it printed; but our author was betrayed by a pretended friend; who acted the part of a ſpy, and informed the archbiſhop of Vitelli, then the pope's nuncio at Venice, juſt as the work was finiſhed at the preſs: at the ſame time, this treacherous friend bought the whole impreſſion; and upon the nuncio's complaint, Pallavicini was impriſoned. In this miſerable condition he found a friend in one of his miſtreſſes, who, ſeeing him abandoned by moſt of his patrons, not only ſupported him, but conveyed letters to him, by which ſhe gave him ſuch information as enabled him to make a proper defence, and to recover his liberty.

But a war having in the mean time broke out between the Barberini and the duke of Parma; Pallavicini,

vicini, in order to revenge himſelf upon the ſuppoſed inſtruments of his impriſonment, wrote a piece entitled "The tinkling Inſtrument to call together the Barberini Bees;" and dedicated it in terms of the profoundeſt contempt to the nuncio Vitelli. The nuncio finding that little notice was taken of his complaints on the occaſion, procured by bribery one Charles Morfu, a Frenchman of infamous character, who pretended to paſs for a gentleman, to enſnare Pallavicini: to which end, the traitor uſed his beſt endeavours to inſinuate himſelf into his friendſhip, and at length exhorted him to accompany him to France. He declared that his fortune would be made by the extraordinary encouragement which was given to men of letters by Cardinal Richelieu; and the better to favour the deceit, he produced feigned letters from the Cardinal, inviting our author to France, and expreſſing a deſire he had to eſtabliſh in Paris an academy for the Italian tongue, under the direction of Pallavicini. The ſnare took; and now, faſcinated by the proſpect of gain, Pallavicini ſuffered himſelf to be led like an ox to the ſlaughter, whitherſoever Morfu thought proper. He left Venice much againſt the advice of his friends, and went firſt to Bergamo, where he ſpent a few days with ſome of his relations, by way of giving ſome entertainment to Morfu. They then ſet off for Geneva, to the great ſatisfaction of our author, who propoſed to get ſome of his works printed there, which he had not been able to do in Italy. Morfu, however, inſtead of conducting him to Paris, took the road to Avignon; where, croſſing the bridge of Soraces, in the county of Venaiſſin, they were ſeized by a gang of *ſbirri*, or ſheriff's officers, on pretence of carrying contraband goods, and confined. Morfu was quickly diſcharged, and very liberally rewarded; but Pallavicini, being carried to Avignon, was impriſoned; and notwithſtanding, on his examination concerning ſome papers found upon him, he made a very artful defence, it was in vain. The ſentence was already brought from Rome, and he was to undergo a trial merely for form's ſake. For this purpoſe being put into a dark dungeon, he made another effort to eſcape. He managed matters ſo well with his keeper, as to procure wax candles to be allowed him, under pretence of amuſing himſelf with reading; and when he had got a number of theſe, he ſet fire one night to the priſon door, in order to get off by that means; but the ſtratagem did not ſucceed, and he was of courſe confined much cloſer, and treated with great inhumanity. After a year's ſuffering, he was brought to trial, in which he made an excellent defence, and flattered himſelf with hopes of relief. He had even begun a whimſical piece on the ſubject of melancholy; but, contrary to his expectations, he was ſentenced to die, and loſt his head on a ſcaffold in the flower of his age.

He was of ſo heedleſs and profuſe a diſpoſition, that had he poſſeſſed an immenſe eſtate he would have ſpent it all. He was never engaged in a virtuous paſſion, being inflamed to a prodigious and unnatural degree with the love of the meaneſt and moſt infamous proſtitutes. On the other hand, no one could be more ſincere and faithful in his friendſhips, nor was ever a man a greater prey to treachery; inſomuch, that when releaſed from priſon in Venice, he was told that a wretch had betrayed him, he could not be prevailed upon to believe it, ſaying, "How can this be, ſince he declared himſelf my friend, and I made him privy to all my concerns!" He uſed, while he wore a religious habit, to ſtudy or write two or three hours in bed every morning. The reſt of the day he ſpent either in the company of idle perſons, or elſe with the ladies: but after he had wholly left the monaſtic life, upon pretence of ſecuring himſelf from the ſnares of his enemies, he lived in a very irregular manner. He was poſſeſſed of a fine genius, and had a great facility in writing; and till he was corrupted by the commerce of mean lewd women, he wrote pieces worthy of immortality. He did not ſpend much time or pains either in compoſition or in reviſion, for he frequently ſent to the preſs the very firſt exertions of his genius; yet nature had given him ſo noble a vein of eloquence, which he had greatly improved by peruſing the beſt authors, that his firſt thoughts were often equal to the moſt laboured compoſitions. He was modeſt, and ſpoke of himſelf with diffidence; but his works are ſtrongly tinctured with envy, malice, and gall. He made but a poor figure in converſation; and when with perſons of worth and diſtinction, would often retire to a corner of the room, and ſeem quite wrapt up in thought. He never exerted his wit and humour after his return from Germany, but when he was in the company of ſome mean women. Upon the whole, it is difficult to determine whether vice or virtue was the moſt predominant feature in his character. His death gave birth to a dialogue, entitled, *Anima erranti di Ferrante Pallavicini*, or, "The wandering Ghoſt of Pallavicini." Beſides his life at the head of his works in two volumes, there is another prefixed to the "Divortio celeſte," at Amſterdam in 1696.

PALLENE, a ſmall peninſula of Thrace or Macedonia, formerly called *Phlegra*. It is ſituated near the bay of Thermæ, and contains five cities, the principal of which is called *Pallene*. It was famous, according to ſome of the ancients, for an engagement between the gods and the giants.

PALLET, among painters, a little oval table, or piece of wood, or ivory, very thin and ſmooth; on and round which the painters place the ſeveral colours they have occaſion for, to be ready for the pencil. The middle ſerves to mix the colours on, and to make the tints required in the work. It has no handle, but, inſtead thereof, a hole at one end to put the thumb through to hold it.

Pallet, among potters, crucible makers, &c. a wooden inſtrument, almoſt the only one they uſe, for forming, beating, and rounding their works. They have ſeveral kinds: the largeſt are oval, with a handle; others are round, or hollowed triangularly; others, in fine, are in manner of large knives, ſerving to cut off whatever is ſuperfluous on the moulds of their work.

Pallet, in gilding, an inſtrument made of a ſquirrel's tail, to take up the gold leaves from the pillow, and to apply and extend them on the matter to be gilt. See Gilding.

Pallet, in heraldry, is nothing but a ſmall pale, conſiſting of one half of it in breadth, and therefore there are ſometimes ſeveral of them upon one ſhield.

Pallet, is alſo a part belonging to the balance of a watch or movement. See the article Watch.

PALLIATÆ, a name which the Romans gave to ſuch plays as laid the plot in Greece, and required the performers to appear in Grecian habits. It is uſed in contradiſtinction to *togatæ*, in which the ſcene was laid at Rome, and in which the dreſſes were Roman. The word palliatæ is derived from *pallium*, which was a part of dreſs peculiar to the Greeks; whereas the toga belonged to the Romans only. See Togatæ, Comedy, &c.

PALLIATION, or a Palliative *Cure*, in medicine, is when, in deſperate and incurable diſeaſes, after predicting the fatal event, the phyſician preſcribes ſome remedies for mitigating the pain or ſome other urgent ſymptoms, as in ulcerated cancers, or cancerous fiſtulas, and the like.

PALLIO *Cooperire*. It was an ancient cuſtom, where children were born out of lawful wedlock, and their parents were afterwards married, that thoſe children, together with the father and mother, ſhould ſtand *pallio cooperti*, under a cloth, while the marriage was ſolemnizing; which was a kind of adoption, and had the effect of a legitimation. Thus Robert Groſthead, the famous biſhop of Lincoln, in one of his letters, ſays: *In ſignum legitimationis, nati ante matrimonium conſueverunt poni ſub* pallio *ſuper parentes eorum extento, in matrimonii ſolemnizatione.*

Selden, in his notes on Fleta, adds, that the children of John of Gaunt, duke of Lancaſter, by Catharine Swinford, though legitimated by act of parliament, yet were *covered with the pall* when their parents were married.

PALLIUM, a word often mentioned in our old hiſtorians. Durandus tells us, that it is a garment made of white wool, after the following manner, viz. The nuns of St Agnes, every year, on the feaſt day of their ſaint, offer two white lambs on the altar of their church, during the time they ſing *Agnus Dei*, in a ſolemn maſs; which lambs are afterwards taken by two of the canons of the Lateran church, and by them given to the pope's ſubdeacons, who ſend them to paſture till ſhearing time, and then they are ſhorn, and the pall is made of their wool mixed with other white wool. The pall being thus made, is carried to the Lateran church, and there placed on the high altar, by the deacons of that church, on the bodies of St Peter and St Paul; and after an uſual watching, it is carried away in the night, and delivered to the ſubdeacons, who lay it up ſafe. And becauſe it was taken from the body of St Peter, it ſignifies the plenitude of eccleſiaſtical power: and therefore it was the prerogative of popes, who pretend to be the immediate ſucceſſors of that ſaint, to inveſt other prelates with it; which at firſt was done nowhere but at Rome, though afterwards at other places.

Pallium, in antiquity, an upper garment or mantle worn by the Greeks, as the toga was by the Romans. Each of theſe was ſo peculiar to the reſpective nations, that *Palliatus* is uſed to ſignify a Greek, and *Togatus* a Roman.

PALM, has among almoſt all nations been regarded as an emblem of victory, and aſſigned as the reward of it. The reaſon why this tree was adopted, and made uſe of to repreſent victory, is ſaid to be, becauſe it is ſo elaſtic, that if preſſed by the greateſt weight, it will riſe ſuperior to the preſſure, and be able to reſtore itſelf to its former ſtate, appearing almoſt invincible.

Palm-Sunday, in the Chriſtian church, the Sunday next before Eaſter; being ſo called in memory of our Saviour's triumphal entry into Jeruſalem, when the multitude that attended him ſtrewed branches on his way.

The ancients had other names for this day. For, 1. They called it *Dominica Competentium*, i. e. Sunday of the Competentes; becauſe on that day the catechumens came to aſk the biſhop leave to be admitted to baptiſm, which was conferred the Sunday following. They had alſo then given them the ſymbol or credo, to get off by heart, to be repeated to the biſhop in the ceremony of baptiſm. 2. They called it *Capitiluvium*, the Sunday of waſhing the head; becauſe thoſe who were to be baptized the following Sunday, were prepared by waſhing their heads on this day. Some time afterwards they called it *Indulgence Sunday*, becauſe the emperors and patriarchs uſed to diſtribute gifts on that day.

Palm-Tree, in botany. See Phoenix.

PALMA, or *Palma Nova*, a very ſtrong town of Italy, in the territory of Venice, and in Friuli. It is a very important place, for the defence of the Venetians againſt the Auſtrian and Turks; and was built in 1593, for that very purpoſe. They have cut a canal near this place, which is very advantageous. It is ſeated on the ſea ſide, 10 miles ſouth-eaſt of Udino, and 55 north-eaſt of Venice. E. Long. 13. 15. N. Lat. 46. 2.

Palma, an iſland in the Atlantic ocean, and one of the Canaries, 56 miles north-weſt of Gomera, and about 75 in circumference. It abounds in wine and ſugar; and has a handſome town of the ſame name, which carries on a trade in wine to the Weſt Indies and other parts. Their beſt vines grow in a ſoil called the *Brenia*, where they make 12,000 butts of wine every year, which is well known by the name of *palm wine*. There is plenty of cattle, and all ſorts of fruits. In 1625 a volcano broke out in this iſland, with a moſt violent earthquake; the flame was ſeen for ſix weeks together, and a great quantity of aſhes were thrown as far as Teneriff. It was conquered by the Spaniards in 1460.

PALMÆ, *Palms*. Under this name Linnæus has arranged ſeveral genera, which, although capable of a place in ſeparate claſſes of his ſyſtem, he chooſes rather, on account of their ſingular ſtructure, to place apart, in an appendix to the work.—See Areca, Chamærops, Phoenix, Cocos, &c.; and Corypha,

The ſame plants conſtitute one of the ſeven families or tribes into which all vegetables are diſtributed by Linnæus in his *Philoſophia Botanica*. They are defined to be plants with ſimple ſtems, which at their ſummit bear leaves reſembling thoſe of the ferns, being a compoſition of a leaf and a branch; and whoſe flowers and fruit are produced on that particular receptacle or ſeat called a *ſpadix*, protruded from a common calyx in form of a ſheath or ſcabbard, termed by Linnæus *ſpatha*.

Palmæ is likewiſe the name of the firſt order in Linnæus's Fragments of a Natural Method. See Botany, p. 457.

PALMARIS muscle, in anatomy. See there, *Table of the Muſcles*.

PALMATED, ſomething reſembling the ſhape of the hand: thus we ſay, palmated leaves, roots, ſtones, &c.

PALMERSTON's Island, ſituated in the South Seas, which Captain Cook viſited in his ſecond and laſt voyages. It conſiſts of a group of ſmall iſlets, nine or ten in number, connected by a reef of coral rocks, and lying in a circular direction. It admits of no anchorage, nor are there any inhabitants on it, though it abounds with cocoa nuts, ſcurvy graſs, and the wharra tree. This iſland is not more than a mile in circumference, and is not elevated above three feet above the level of the ſea. It conſiſts entirely of a coral ſand, with a ſmall mixture of blackiſh mould, which appeared to be produced from rotten vegetables. "At one part of the reef (ſay our navigators), which bounds the lake within, almoſt even with the ſurface, there was a large bed of coral, which afforded a moſt enchanting proſpect. Its baſe, which was fixed to the ſhore, extended ſo far that it could not be ſeen, ſo that it appeared to be ſuſpended in the water. Even this delightful ſcene was greatly improved by the multitude of fiſhes that gently glided along, ſeemingly with the moſt perfect ſecurity. Their colours were the moſt beautiful that can be imagined, blue, yellow, black, red, &c. far excelling any thing that can be produced by art. The richneſs of this ſubmarine grotto was greatly increaſed by their various forms; and the whole could not poſſibly be ſurveyed without a pleaſing tranſport, accompanied at the ſame time with regret, that a work ſo aſtoniſhingly elegant ſhould be concealed in a place ſo ſeldom explored by the human eye." E. Long. 196. 35. S. Lat. 18. 8.

PALMIPEDES, among ornithologiſts, the ſame with web-footed birds. See Ornithology.

PALMISTRY, a kind of divination, or rather a deceitful art practiſed by gypſies, who pretend to foretel events by looking upon the lines and marks of the hand.

PALMUS, a long meaſure uſed both by the Greeks and Romans. The Grecian palmus was of two ſorts; the greater, which contained nine finger breadths, and the leſs which contained four. The Roman palmus was alſo of two ſorts; the greater, which contained twelve finger breadths, or eight inches and a half Engliſh; and the leſs, which contained four finger breadths, or near three inches Engliſh.—The great palmus was taken from the length of the hand or ſpan; the leſs from the breadth of it. The Greek palmus was called *doran*. See Measure.

PALMYRA, or Tadmor, a noble city of ancient Syria, now in ruins, the origin of whoſe name is uncertain. Neither is it well known by whom this city was built; for though, from the identity of the names, it is thought by many to have been the *Tadmor in the wilderneſs* built by Solomon †, this point, however, is much controverted by many learned men. For the world have been long and juſtly aſtoniſhed to find in the deſert of Syria, at a diſtance from the ſea, with a very precarious and ſcanty ſupply of water only, and without a particular connexion with any great monarchy, ruins of a city more extenſive and ſplendid than Rome itſelf, the depoſitary of all the arts which Greece in its moſt flouriſhing periods could afford. The problem is an intricate one; yet when we diveſt it of many of its difficulties, we ſhall bring this ſtupendous prodigy to no very uncommon magnitude. The coaſt of Syria was in very early ages rich and populous; and either from the conveniency of procuring water, or from the vicinity of India and Egypt, the population, inſtead of increaſing on the mountains, extended to Judea, and from thence through its plains only to the internal parts. The ruins of this numerous people, and of their habitations, remain; but as their edifices were not uncommonly ſplendid, or, as the cauſes of their deſtruction were powerful, they have not attracted much attention. Yet the ruins of more than 30 towns are diſcoverable to the ſouth-eaſt of the Dead Sea, and from thence towards Tadmor or Palmyra; we know the cauſe of the deſtruction of theſe towns, and we know that it did not reach Palmyra. This ſplendid city was not, therefore, inſulated in a maſs of ſand: it was probably a link of a continued chain of population, or perhaps its termination. The ſituations of towns in the Sandy Deſert muſt neceſſarily be determined by local advantages. Tadmor is ſituated where two hills converge, and beyond the point where they approach. Theſe hills afforded water, that neceſſary aid to animal life; and the aqueducts through which it was brought from them were diſcovered and deſcribed by Mr Wood. Though the other towns now in ruins afford ſome remains of luxury and opulence, yet in theſe reſpects they are much inferior to Palmyra; and this deſerves to be explained. Palmyra was undoubtedly very ancient. "The two ſprings of freſh water it poſſeſſes (ſays Volney †) were, above all, a powerful inducement in a deſert everywhere elſe ſo parched and barren. Theſe, doubtleſs, were the two principal motives which drew the attention of Solomon, and induced that commercial prince to carry his arms ſo remote from the limits of Judea." "He built ſtrong walls there (ſays the hiſtorian Joſephus), to ſecure himſelf in the poſſeſſion, and named it *Tadmor*, which ſignifies the Place of Palm trees." Hence it has been inferred that Solomon was its firſt founder; but we ſhould, from this paſſage, be rather led to conclude that it was already a place of known importance. The palm trees he found there are not the trees of uninhabited countries. Prior to the days of Moſes, the journeys of Abraham and Jacob from Meſopotamia into Syria, ſufficiently prove a communication between theſe countries, which muſt ſoon have made Palmyra flouriſh. The cinnamon and pearls mentioned in the time of the Hebrew legiſlator, demonſtrate a trade with India and the Perſian gulf, which muſt have been carried on by the Euphrates and Palmyra. At this diſtance of time, when the greater part of the monuments of theſe early ages have periſhed, we are liable to form very falſe opinions concerning the ſtate of theſe countries in thoſe remote times, and are the more eaſily deceived, as we admit as hiſtorical facts antecedent events of an entirely different character. If we obſerve, however, that men in all ages are united by the ſame intereſts and the ſame deſires, we cannot help concluding, that a commercial intercourſe muſt early have taken place between one nation and another, and that this intercourſe muſt have been nearly the ſame with that of more modern times. Without, therefore, going higher than the reign of Solomon, the invaſion of Tadmor by that prince is ſufficient alone to throw a great light on the hiſtory of this city. The king of Jeruſalem would never have carried his attention to ſo diſtant and detached a ſpot, without ſome powerful motive of intereſt; and this intereſt could be no other than that of an extenſive commerce, of which this place was already the emporium. This commerce extended itſelf to India; and the Perſian gulf was the principal point of union."

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† 1 Kings, ix. 18. and 2 Chron. viii. 4. and Joſephus, Ant. Jud. Lib. I.

† *Travels through Syria and Egypt.*

From the nature of the commodities, from the requiſite aſſiſtance of the Tyrians, and other forcible arguments, M. Volney ſhows that the Perſian gulf was the centre of the moſt ancient commerce of the eaſtern world; and that it was with a view of obtaining a ſhorter route, by means of the Euphrates, that Solomon turned his attention to Tadmor, diſtant but three days journey from it. Our author goes on, "We may even reaſonably conjecture, when we reflect on the revolutions of the following ages, that this commerce became a principal cauſe of thoſe various wars in Lower Aſia, for which the barren chronicles of thoſe early times aſſign no motives. If, after the reign of Solomon, the Aſſyrians of Nineveh turned their ambitious views towards Chaldea, and the lower part of the Euphrates, it was with the intention to approach that great ſource of opulence the Perſian gulf. If Babylon, from being the vaſſal of Nineveh, in a ſhort time became her rival, and the ſeat of a new empire, it was becauſe her ſituation rendered her the emporium of this lucrative trade; in ſhort, if the kings of this great city waged perpetual wars with Jeruſalem and Tyre, their object was not only to deſpoil theſe cities of their riches, but to prevent their invading their trade by the way of the Red ſea. An hiſtorian who has informed us that Nabuchodonoſor, before he laid ſiege to Jeruſalem, took poſſeſſion of Tadmor, clearly indicates that the latter city acted in concert with the two neighbouring capitals. Their gradual decline became, under the Perſian empire, and the ſucceſſors of Alexander, the efficient cauſe of the ſudden greatneſs of Palmyra in the time of the Parthians and Romans; ſhe then enjoyed a long peace for many centuries, which allowed her inhabitants to erect thoſe monuments of opulence whoſe ruins we ſtill admire." If the former obſervations ſhowed the connexion of this remote ſpot with a more populous country, theſe remarks explain the cauſe of the renovation, and of the magnificence of this city. Our author's remarks are at leaſt probable, and are, in our opinion, very convincing. Cairo, in another, probably a ſubordinate route, never attained the ſplendour of Palmyra; but the genius of the Egyptians, perhaps the laws of Egypt, prevented it.

There is, however, no authentic hiſtory of Palmyra till after the captivity of the Roman emperor Valerian by the Perſians. It is firſt mentioned by the Roman hiſtorians, as a place which Mark Antony attempted to plunder, upon pretence that it had not obſerved a juſt neutrality between the Romans and Parthians. Pliny takes notice of it as being ſituated in a rich ſoil, among pleaſant ſtreams, and totally ſeparated from the reſt of the world by a vaſt ſandy deſert, which had preſerved its independence between Parthia and Rome. There is ſtill a conſiderable ſpot of good ſoil next the town and on the hills; and even in the wilderneſs, there were palms and fig trees, ſome of which remained till the latter end of the 17th century, though not one is now to be found.

After the captivity of Valerian, it was become an opulent city, to which its ſituation in the vinicity of the Roman and Parthian empires greatly contributed; as the caravans, in going to or returning from the eaſt, frequented the place, and thus rendered it a conſiderable ſeat of merchandiſe. It enjoyed an independency till the time of Trajan; who, having made himſelf maſter of almoſt all the Parthian empire, reduced Palmyra likewiſe, and it was afterwards accounted part of the Roman dominions. But when the defeat and captivity of Valerian had ſo much weakened the empire, that the Perſians ſeemed to be in a fair way of becoming maſters of all the eaſtern provinces, the Palmyrenians began to entertain thoughts of recovering their liberty. Odenathus, prince of Palmyra, ſent a very reſpectable letter to Sapor on his return, accompanied with conſiderable preſents; but by that haughty conqueror his letter and embaſſy were treated with the moſt provoking contempt. The preſents were thrown into the Euphrates: and to his letter Sapor replied, That his inſolence in preſuming to write to his lord was inexcuſable; but if he could atone for it in any way, it would be by preſenting himſelf before the the throne bound hand and foot, in token of a conſciouſneſs of his crime, and the puniſhment he deſerved. With this injurious treatment Odenathus, was ſo provoked, that he ſwore either to bring down the pride of the haughty conqueror, or die in the attempt. Accordingly, having aſſembled what forces he could, he fell upon the Perſians, deſtroyed a number of them, took a great part of their baggage, and ſome of the king's concubines. Of the war of Odenathus with the Perſians, however, we know very little: only that though the latter were often vanquiſhed and the independency of Palmyra eſtabliſhed for the preſent; yet Valerian was never releaſed from his captivity, though Odenathus earneſtly wiſhed to have the honour of reſcuing him from his enemies.

Odenathus enjoyed his ſovereignty but a very ſhort time: being murdered by his nephew, who was ſoon after put to death by Zenobia the wife of Odenathus. This lady is ſaid to have been poſſeſſed of very extraordinary endowments both of body and mind, being, according to Mr Gibbon, almoſt the only Aſiatic woman who is recorded to have overcome the obſtacles ariſing from the confined ſituation of the fair ſex in that part of the world. Immediately on taking vengeance for the murder of her huſband, ſhe aſſumed the government, and ſoon ſtrengthened herſelf ſo much, that ſhe reſolved to ſubmit neither to the Roman nor Perſian power. The neighbouring ſtates of Arabia, Armenia, and Perſia, dreaded her enmity, and ſolicited her alliance. To the dominions of Odenathus, which extended from the Euphrates to the frontiers of Bithynia, his widow added the inheritance of her anceſtors, the populous and fertile kingdom of Egypt. The emperor Claudius acknowledged her merit, and was content, that, while he purſued the Gothic war, ſhe ſhould aſſert the dignity of the empire in the eaſt. The conduct, however, of Zenobia, was attended with ſome ambiguity; nor is it unlikely that ſhe had conceived the deſign of erecting an independent and hoſtile monarchy. She blended with the popular manners of Roman princes the ſtately pomp of the courts of Aſia, and exacted from her ſubjects the ſame adoration that was paid to the ſucceſſors of Cyrus. She beſtowed on her three ſons a Latin education, and often ſhowed them to the troops adorned with the imperial purple. For herſelf ſhe reſerved the diadem, with the ſplendid but doubtful title of *Queen of the Eaſt*.

When Aurelian paſſed over into Aſia, againſt an adverſary whoſe ſex alone could render her an object of contempt, his preſence reſtored obedience to the province of Bithynia, already ſhaken by the arms and intrigues of Zenobia. Advancing at the head of his legions, he accepted the ſubmiſſion of Ancyra; and was admitted into Tyana, after an obſtinate ſiege, by the help of a perfidious citizen. The generous, though fierce temper of Aurelian, abandoned the traitor to the rage of the ſoldiers: a ſuperſtitious reverence induced him to treat with lenity the countrymen of Apollonius the philoſopher. Antioch was deſerted on his approach; till the emperor, by his ſalutary edicts, recalled the fugitives, and granted a general pardon to all who, from neceſſity rather than choice, had been engaged in the ſervice of the Palmyrenian queen. The unexpected mildneſs of ſuch a conduct reconciled the minds of the Syrians, and, as far as the gates of Emeſa, the wiſhes of the people ſeconded the terror of his arms.

Zenobia would have ill deſerved her reputation, had ſhe indolently permitted the emperor of the Weſt to approach within 100 miles of her capital. The fate of the Eaſt was decided in two great battles; ſo ſimilar in almoſt every circumſtance, that we can ſcarcely diſtinguiſh them from each other, except by obſerving that the firſt was fought near Antioch, and the ſecond near Emeſa. In both, the queen of Palmyra animated the armies by her preſence, and devolved the execution of her orders on Zabdas, who had already ſignalized his military talents by the conqueſt of Egypt. The numerous forces of Zenobia conſiſted for the moſt part of light archers, and of heavy cavalry clothed in complete ſteel. The Mooriſh and Illyrian horſe of Aurelian were unable to ſuſtain the ponderous charge of their antagoniſts. They fled in real or affected diſorder, engaged the Palmyrenians in a laborious purſuit, haraſſed them by a deſultory combat, and at length diſcomfited this impenetrable but unwieldy body of cavalry. The light infantry, in the mean time, when they had exhauſted their quivers, remaining without protection againſt a cloſer onſet, expoſed their naked ſides to the ſwords of the legions. Aurelian had choſen theſe veteran troops, who were uſually ſtationed on the Upper Danube, and whoſe valour had been ſeverely tried in the Allemannic war. After the defeat at Emeſa, Zenobia found it impoſſible to collect a third army. As far as the frontier of Egypt, the nations ſubject to her empire had joined the ſtandard of the conqueror; who detached Probus, the braveſt of his generals, to poſſeſs himſelf of the Egyptian provinces. Palmyra was the laſt reſource of the widow of Odenathus. She retired within the walls of her capital; made every preparation for a vigorous reſiſtance; and declared with the intrepidity of a heroine, that the laſt moment of her reign and of her life ſhould be the ſame.

In his march over the ſandy deſert, between Emeſa and Palmyra, the emperor Aurelian was perpetually haraſſed by the Arabs; nor could he always defend his army, and eſpecially his baggage, from thoſe flying troops of active and daring robbers, who watched the moment of ſurpriſe, and derided the ſlow purſuit of the legions. The ſiege of Palmyra was an object far more difficult and important; and the emperor, who with inceſſant vigour preſſed the attacks in perſon, was himſelf wounded with a dart. "The Roman people, (ſays Aurelian, in an original letter), ſpeak with contempt of the war which I am waging againſt a woman. They are ignorant both of the character and of the power of Zenobia. It is impoſſible to enumerate her warlike preparations, of ſtones, of arrows, and of every ſpecies of miſſile weapons. Every part of the walls is provided with two or three baliſtæ, and artificial fires are thrown from her military engines. The fear of puniſhment has armed her with a deſperate courage. Yet I truſt ſtill in the protecting deities of Rome, who have hitherto been favourable to all my undertakings." Doubtful, however, of the protection of the gods, and of the event of the ſiege, Aurelian judged it more prudent to offer terms of an advantageous capitulation: to the queen, a ſplendid retreat; to the citizens, their ancient privileges. His propoſals were obſtinately rejected, and the refuſal was accompanied with inſult.

The firmneſs of Zenobia was ſupported by the hope, that in a very ſhort time famine would compel the Roman army to repaſs the deſert; and by the reaſonable expectation that the kings of the Eaſt, and particularly the Perſian monarch, would arm in the defence of their moſt natural ally. But fortune, and the perſeverance of Aurelian, overcame every obſtacle. The death of Sapor, which happened about this time, diſtracted the councils of Perſia; and the inconſiderable ſuccours that attempted to relieve Palmyra were eaſily intercepted either by the arms or the liberality of the emperor. From every part of Syria a regular ſucceſſion of convoys ſafely arrived in the camp, which was increaſed by the return of Probus with his victorious troops from the conqueſt of Egypt. It was then that Zenobia reſolved to fly. She mounted the fleeteſt of her dromedaries; and had already reached the banks of the Euphrates, about 60 miles from Palmyra, when ſhe was overtaken by the purſuit of Aurelian's light-horſe, ſeized, and brought back a captive to the feet of the emperor. Her capital ſoon after ſurrendered, and was treated with unexpected lenity. The arms, horſes, and camels, with an immenſe treaſure of gold, ſilver, ſilk, and precious ſtones, were all delivered to the conqueror; who, leaving only a garriſon of 600 archers, returned to Emeſa, and employed ſome time in the diſtribution of rewards and puniſhments at the end of ſo memorable a war, which reſtored to the obedience of Rome thoſe provinces that had renounced their allegiance ſince the captivity of Valerian.

When the Syrian queen was brought into the preſence of Aurelian, he ſternly aſked her, How ſhe had preſumed to riſe in arms againſt the emperors of Rome? The anſwer of Zenobia was a prudent mixture of reſpect and firmneſs: "Becauſe I diſdained to conſider as Roman emperors an Aureolus or a Gallienus. You alone I acknowledge as my conqueror and my ſovereign." But as female fortitude is commonly artificial, ſo it is ſeldom ſteady or conſiſtent. The courage of Zenobia deſerted her in the hour of trial: ſhe trembled at the angry clamours of the ſoldiers, who called aloud for her immediate execution; forgot the generous deſpair of Cleopatra, which ſhe had propoſed as her model; and ignominiouſly purchaſed life by the ſacrifice of her fame and her friends. It was to their councils, which governed the weakneſs of her ſex, that ſhe imputed the guilt of her obſtinate reſiſtance; it was on their heads that ſhe directed the vengeance of the cruel Aurelian. The fame of Longinus, who was included among the numerous and perhaps innocent victims of her fear, will ſurvive that of the queen who betrayed, or the tyrant who condemned him. Genius and learning were incapable of moving a fierce unlettered ſoldier, but they had ſerved to elevate and harmonize the ſoul of Longinus. Without uttering a complaint, he calmly followed the executioner, pitying his unhappy miſtreſs, and beſtowing comfort on his afflicted friends.

Returning from the conqueſt of the Eaſt, Aurelian had already croſſed the ſtraits which divide Europe from Aſia, when he was provoked by the intelligence that the Palmyrenians had maſſacred the governor and garriſon which he had left among them, and again erected the ſtandard of revolt. Without a moment's deliberation, he once more turned his face towards Syria. Antioch was alarmed by his rapid approach, and the helpleſs city of Palmyra felt the irreſiſtible weight of his reſentment. We have a letter of Aurelian himſelf, in which he acknowledges, that old men, women, children, and peaſants, had been involved in that dreadful execution, which ſhould have been confined to armed rebellion: and although his principal concern ſeems directed to the re-eſtabliſhment of a temple of the ſun, he diſcovers ſome pity for the remnant of the Palmyrenians, to whom he grants the permiſſion of rebuilding and inhabiting their city. But it is eaſier to deſtroy than to reſtore. The ſeat of commerce, of arts, and of Zenobia, gradually ſunk into an obſcure town, a trifling fortreſs, and at length a miſerable village.

Little is known concerning the fortunes of Palmyra ſince the time of Mahomet, except that it was conſidered as a place of ſtrength; and that in the 12th century there were 2000 Jews in it. With reſpect to the ruins, they appeared to be of two different and diſtinct periods; the oldeſt are ſo far decayed as not to admit of menſuration, and look as if they had been reduced to that ſtate by the hand of time; the others appear to have been broken into fragments by violence. Of the inſcriptions none are earlier than the birth of Chriſt, and none are later than the deſtruction of the city by Aurelian, except one, which mentions Diocleſian.

Mr Wood is of opinion, that the face of the country which ſurrounds Palmyra was always the ſame; but though Palmyra was always ſaid to be ſituated in a wilderneſs, it does not follow that the wilderneſs was always of the ſame extent: it is perhaps more probable, that when Palmyra was firſt ſettled, the rich ſoil mentioned by Pliny extended much farther; for whatever were the reaſons for making a ſettlement there, Palmyra can ſcarcely be ſuppoſed to have invited a greater number of people than it could feed. The palms and fig trees that were formerly found on the hills, and in the borders of the deſert, that are now totally barren, confirm this opinion. Mr Wood obſerves, that while he was there a whirlwind happened, which took up ſuch quantities of ſand as quite darkened the ſky; this ſand therefore might by degrees encroach upon the fertile environs of Palmyra, and reduce the number of inhabitants as it reduced their ſuſtenance, till the few wretched families only were left, who found it difficult to furniſh food for Mr Wood and his company, though they did not continue longer than a fortnight among them. It will alſo appear from hiſtory, that what is ſuppoſed to have happened here has happened at other places, where ſuch an event was much leſs probable. § On the ſea coaſt in the neighbourhood of St Pol de Leon, in Lower Bretagne, there is a conſiderable tract of land which before the year 1666 was inhabited, but which was rendered uninhabitable by a ſand, which encroaching every year, covered it to the depth of above 20 feet. In the year 1718 it had advanced more than ſix leagues, and within one league of St Pol; ſo that it was then thought probable that the town would of neceſſity be abandoned. This ſand is raiſed by the eaſt or north-eaſt wind, which drives it in clouds with great ſwiftneſs, and in a prodigious quantity. It was alſo atteſted by the captain of a ſhip, and all on board, that in the year 1719 there fell in the Atlantic ocean, at 15 degrees of north latitude, and at the diſtance of more than eight leagues from any land, a ſhower of ſand, ſome of which they produced, and depoſited in the academy at Paris †.

§ *Memoirs of French Academy, for 1718.*

† *Hiſt. of the Acad.* 1772.

The company with whom Mr Wood, the publiſher of the Ruins of Palmyra, travelled, arrived at length at the end of the plain, where a ridge of barren hills, by which it was divided on the right and left, ſeemed to meet; between them there was a vale, through which an aqueduct formerly conveyed water to Palmyra. On each ſide of this vale they remarked ſeveral ſepulchres of the ancient Palmyrenes, which they had ſcarce paſſed, when the hills opening on a ſudden, they diſcovered ſuch piles of ruins as they had never ſeen. They were all of white marble; and beyond them, towards the Euphrates, was a wide level, ſtretching farther than the eye could reach, totally deſolate, without variety, and without bounds. After having gazed ſome time upon this proſpect, which rather exceeded than fell ſhort of their expectations, they were conducted to one of the huts of the Arabs, of which there are about 30 in the court of the great temple. The inhabitants of both ſexes were well ſhaped, and the women, though very ſwarthy, had good features. They were veiled, but did not ſo ſcrupulouſly conceal their faces as the eaſtern women generally do. They paint the ends of their fingers red, their lips blue, and their eyebrows and eyelaſhes black. They had large rings of gold or braſs in their ears and noſtrils, and appeared to be healthy and robuſt. The walls of the city are flanked by ſquare towers, into which ſome ancient funeral monuments have been converted; but the walls are in moſt places level with the ground, and ſometimes not to be traced. It is, however, probable, by their general direction, that they included the great temple, and are three miles in circumference. The Arabs ſhowed a tract which was near ten miles in circumference, the ſoil of which was

Palmyra.

raiſed a little above the level of the deſert: this, they ſaid, was the extent of the old city; and that by digging in any part of it ruins were diſcovered.

Theſe ruins conſiſt of temples, palaces, and porticoes of Grecian architecture; and lie ſcattered over an extent of ſeveral miles. They were accidentally diſcovered by ſome Engliſh travellers from Aleppo ſomewhat more than a century ago. By far the moſt remarkable of them is the Temple of the Sun, of which the ruins are ſpread over a ſquare of 220 yards. It was encompaſſed with a ſtately wall, built of large ſquare ſtones, and adorned with pilaſters within and without, to the number of 62 on a ſide. Within the court are the remains of two rows of very noble marble pillars 37 feet high, with their capitals of moſt exquiſite workmanſhip. Of theſe only 58 remain entire; but there muſt have been many more, for they appear to have gone round the whole court, and to have ſupported a double piazza. The walks on that ſide of the piazza which is oppoſite to the front of the caſtle ſeem to have been the moſt ſpacious and beautiful. At each end of this line are two niches for ſtatues, with their pedeſtals, borders, ſupporters, and canopies, carved with the utmoſt propriety and elegance. The ſpace within this encloſure, which is now filled with the dirty huts of the inhabitants, ſeems to have been an open court, in the middle of which ſtood the temple, encompaſſed with another row of pillars of a different order, and much taller, being 50 feet high; but of theſe 16 only remain. The whole ſpace contained within theſe pillars is 59 yards in length, and near 28 in breadth. The temple is no more than 33 yards in length, and 13 or 14 in breadth. It points north and ſouth; and exactly into the middle of the building, on the weſt ſide, is a moſt magnificent entry, on the remains of which are ſome vines and cluſters of grapes, carved in the moſt bold and maſterly imitation of nature that can be conceived. Juſt over the door are diſcerned a pair of wings, which extend its whole breadth; the body to which they belonged is totally deſtroyed; and it cannot now certainly be known whether it was that of an eagle or a cherub, ſeveral repreſentations of both being viſible on other fragments of the building. It is obſerved of the windows of this building, which were not large, that they were narrower at the top than below. The north end of the building is adorned with the moſt curious fretwork and bas relief; and in the middle there is a dome or cupola about ten feet diameter, which appears to have been either hewn out of the rock, or moulded of ſome compoſition which by time is grown equally hard. North of this place is an obeliſk, conſiſting of ſeven large ſtones, beſides its capital and the wreathed work about it. It is about 50 feet high; and, juſt above the pedeſtal, is 12 feet in circumference. There was probably a ſtatue upon it, which the Turks, in their zeal againſt idolatry deſtroyed. At about the diſtance of a quarter of a mile from this pillar, to the eaſt and weſt, are two others, beſides the fragment of a third; ſo that perhaps they were originally a continued row.

About 100 paces from the middle obeliſk, ſtraight forward, is a magnificent entry to a piazza, which is 40 feet broad, and more than half a mile in length, encloſed with two rows of marble pillars 26 feet high, and eight or nine feet in compaſs. Of theſe there ſtill remain 129; and, by a moderate computation, there could not originally have been leſs than 560. The upper end of the piazza was ſhut in by a row of pillars, ſtanding ſomewhat cloſer than thoſe on each ſide A little to the left are the ruins of a ſtately building which appears to have been a banqueting houſe. It is built of better marble, and is finiſhed with yet greater elegance, than the piazza. The pillars which ſupported it were of one entire ſtone, which is ſo ſtrong, that one of them which is fallen down has received no injury. It meaſures 22 feet in length, and in compaſs 8 feet 9 inches. In the weſt ſide of the piazza are ſeveral apertures for gates into the court of the palace. Each of theſe was adorned with four porphyry pillars, not ſtanding in a line with thoſe of the wall, but placed by couples in the front of the gate facing the palace, two on each ſide. Two of theſe only remain entire, and but one ſtanding in its place. They are 30 feet long and 9 in circumference. On the eaſt ſide of the piazza ſtands a great number of marble pillars, ſome perfect, but the greater part mutilated. In one place 11 are ranged together in a ſquare: the ſpace which they encloſe is paved with broad flat ſtones, but there are no remains of a roof. At a little diſtance are the remains of a ſmall temple, which is alſo without a roof, and the walls are much defaced. Before the entry, which looks to the ſouth, is a piazza ſupported by ſix pillars, two on each ſide of the door, and one at each end. The pedeſtals of thoſe in front have been filled with inſcriptions both in the Greek and Palmyrene languages, which are become totally illegible. Among theſe ruins are many ſepulchres; they are ranged on each ſide of a hollow way, toward the north part of the city, and extend more than a mile. They are all ſquare towers, four or five ſtories high. But though they are alike in form, yet they differ greatly in magnitude and ſplendour. The outſide is of common ſtone, but the floors and partitions of each ſtory are marble. There is a walk acroſs the whole building, juſt in the middle; and the ſpace on each hand is ſubdivided into ſix partitions by thick walls. The ſpace between the partitions is wide enough to receive the largeſt corpſe; and in theſe niches there are ſix or ſeven piled upon one another.

Many inſcriptions have been found at Palmyra, which have occupied much of the attention of the learned; and if any thing certain could be derived from them, there is no doubt but they would tend very conſiderably to the elucidation of ancient hiſtory. See Barthelemi's Reflections on the Palmyrene Alphabet, publiſhed at Paris in 1754; and *An Explication* of the inſcriptions at Palmyra hitherto publiſhed, by John Swinton of Chriſt church, Oxford. See alſo Phil. Tranſ. N° 217. and 218.; the firſt volume of the Ancient Univerſal Hiſtory; and, above all, conſult the *Ruins of Palmyra, or Tadmor in the Deſert*, publiſhed by Mr R. Wood, who, with M. Bouverie and Mr Dawkins, travelled thither in 1751. The reſult of their obſervations was publiſhed in 1753, in the form of an atlas. The ruins of this once mighty and celebrated city are repreſented in 57 copperplates, 16 by 12 inches, printed on imperial paper. The are admirably executed; the drawing is correct and maſterly; and the graving highly finiſhed: nor can they fail to give ſatisfaction to thoſe who are connoiſſeurs in the art, or to thoſe who delight in the labours of antiquity. In a work like ours, however, it is impoſſible to give theſe views at length; we ſhall content ourſelves then, after referring to this ſplendid work, with a view of the ruins of the Temple of the Sun, and of ſome other miſcellaneous ruins.

Plate CCCLXXII.

Palmyra was viſited by Mr Bruce before his journey into Abyſſinia; but, on account of the many publications concerning theſe celebrated ruins, he has declined ſaying much concerning them. He informs us, that, before he came in ſight of the ruins, he aſcended a hill of white gritty ſtone, in a very narrow winding road, ſuch as is called a paſs; but on getting up to the top his eyes were ſtruck with the moſt ſtupendous ſight which, he believes, ever mortal ſaw. The whole plain below, which is very extenſive, was ſo covered with magnificent buildings, that they ſeemed to touch one another. All of them are finely proportioned, agreeably ſhaped, and compoſed of white ſtones, which at that diſtance appeared like marble. In taking a draught of theſe ruins, Mr Bruce divided the whole into ſix angular views, for which the ſituation of the place is very convenient. The columns are all uncovered to the very baſes, the ground on which they are built being hard and ſolid. The views he took were upon large paper; ſome of the columns being repreſented a foot long, and ſome of the figures in the foreground of the Temple of the Sun (a magnificent building which ſtood at one end of the town) being near four inches. Before he left Palmyra he obſerved its latitude with a reflecting quadrant of Hadley; but as the inſtrument was out of order, he could not determine it exactly. In his opinion, however, 33° 58′ is not far diſtant from truth. From ſuch obſervations as he could make on the longitude, he concluded it to be 37° 9′ eaſt from Greenwich. Mr R. Wood makes the latitude 34° north.

From Palmyra Mr Bruce proceeded to Baalbec, diſtant about 130 miles, where he found ruins ſtill more magnificent. The interior part of the great temple at this place, according to our author, ſurpaſſes any thing he had ſeen at Palmyra, or anywhere elſe. "All theſe views of Palmyra and Baalbec (ſays he) are now in the king's collection. They are the moſt magnificent offering, in their line, that ever was made by one ſubject to his ſovereign."—In the neighbourhood of Palmyra are ſome ſalt marſhes; and to the adjacent country a trade is carried on in kelp from Tripoli in Syria. There are two Arab tribes, almoſt equally powerful; one of them, called Annecy, remarkable for the fineſt horſes in the world. They poſſeſs the country to the ſouth-weſt, at the back of Libanus, about Bozrah, and ſouthward towards the borders of Arabia Petræa and Mount Horeb. The other tribe, named Mowalli, inhabit the plains eaſt from Damaſcus, to the Euphrates, and north to near Aleppo. They are fewer in number than the Annecy, but much better ſoldiers; and their breed of horſes not greatly inferior.

Reſpecting the latitude and longitude there are ſtill various opinions: that which appears to be neareſt the truth is E. Long. 38. 50. N. Lat. 33. 20. It ſtands about 50 leagues ſouth-eaſt of Aleppo, as much from Damaſcus, and 20 leagues weſt of the Euphrates.

PALPABLE, ſomething perceivable by the ſenſes, particularly that of feeling.

PALPITATION *of the Heart*. See MEDICINE, N° 97. 290.

PALSGRAVE (John), a learned writer, who flouriſhed in the reigns of Henry VII. and Henry VIII. He received his grammatical learning at London, his native place. He ſtudied logic and philoſophy at Cambridge, at which univerſity he reſided till he became bachelor of arts; after which he went to Paris, where he ſpent ſeveral years in the ſtudy of philoſophy and other parts of learning, took the degree of maſter of arts, and acquired ſuch excellence in the French tongue, that in 1514, when a treaty of marriage was negotiated between Louis XII. king of France, and the princeſs Mary, ſiſter of Henry VIII. of England, Mr Palſgrave was appointed to be her tutor in that language. But Louis XII. dying ſoon after his marriage, Palſgrave attended his fair pupil back to England, where he taught the French language to many of the young nobility, obtained good preferment in the church, and was appointed by the king one of his chaplains in ordinary. In 1531 he ſettled at Oxford for ſome time, and the next year was incorporated maſter of arts there, as he had before been in Paris, and a few days after was admitted to the degree of bachelor of divinity. At this time he was much eſteemed for his learning; and, what is very remarkable, though an Engliſhman, he was the firſt who ever reduced the French language to grammatical rules, or that had attempted to fix it to any kind of ſtandard. This he undertook, and executed with great ingenuity and conſiderable ſucceſs, in a large work which he publiſhed in that language at London, entitled *L'Eclairciſſement de la Language Françoiſe*, in three books in thick folio, 1530, to which he has prefixed a large Engliſh introduction; ſo that the French nation ſeems to ſtand originally indebted to the Engliſh for that univerſality which the language at preſent poſſeſſes, and on which they ſo much pride themſelves. He tranſlated into Engliſh a Latin comedy called *Acolaſtus*, written by one Will. Fullonius, an author then living at Hagen in Holland.

At what time Mr Palſgrave was born, or how long he lived, it is not eaſy to ſay; yet, from the concurrence of ſeveral facts, he appears to have been much leſs than 60 years of age at the time of his publiſhing the above-mentioned tranſlation, which was in the year 1540.

PALSY. See MEDICINE, N° 92. 265, &c. and 269.

PALUDAMENTUM, in Roman antiquity, a habit that differed but little from the chlamys, except that this laſt belonged chiefly to the lower claſs of people. It was worn by the officers and principal men among the Romans in time of war, who are therefore called *Paludati*; which diſtinguiſhed them from the common ſoldiers, who, becauſe they wore the ſagum, were called the *Sagati*. The paludamentum came down only to the navel, was open on the ſides, had ſhort ſleeves reſembling angels wings, and was generally white or red. It is ſometimes uſed to ſignify the common ſoldier's coat.

PALUS MEOTIS, the ancient name of a gulf between Europe and Aſia, to the north of the Black ſea, now called the *ſea of Zabach*, or *Aſoph*.

PALY, or PALE, in heraldry, is when the ſhield is

Ruins of the Ancient City of Palmyra.

The Remains of the Great Temple of the Sun in Palmyra from the West.

A. Bell Prin. Wal. Sculptor fecit.

Paly

Pan.

divided into four or more equal parts, by perpendicular lines falling from the top to the bottom.

Paly Bende, is when the eſcutcheon is divided by perpendicular lines, which is *paly*; and alſo by diagonals, which is called *bendy*.

PAMBOUK, the Turkiſh name of the ruined city of Hierapolis. See HIERAPOLIS.

PAMPELUNA, the capital of the kingdom of Navarre in Spain, with a very ſtrong citadel and rich biſhopric. It is handſome and populous, and carries on a great trade, ſeated on a very fertile plain, in E. Long. 1. 25. N. Lat. 42. 42.

PAMPELUNA, a town of New Granada in South America, famous for its gold mines and numerous flocks of ſheep. W. Long. 68. 30. N. Lat. 6. 30.

PAMPHILUS, a celebrated painter of Macedonia, in the age of Philip. He was founder of the ſchool for painting at Sicyon; and he made a law which was obſerved not only in Sicyon but all over Greece, that none but the children of noble and dignified perſons ſhould be permitted to learn painting. Apelles was one of his pupils.

PAMPHYLIA, the ancient name of a country of Natolia, in Aſia, now called *Carimania* and *Cay-bay*, between Lycia and Cilicia, on the ſouth coaſt, to the north of the Mediterranean ſea.

PAN, the god of ſhepherds, hunters, and all country exerciſes. Such he is deſcribed by the Greek and Roman poets; but he bore a higher character among the earlieſt Greeks, as well as among the Egyptians; from whom his worſhip was borrowed by that people. In Egypt he was known by the name of *Mendes*, which, according to Jablonſki ‡, ſignifies fecundity. Hence his ſymbol was a living he goat, the moſt salacious of all animals: "Hircum Mendeſium colunt Ægyptii, eo quod virtuti prolificæ ac genitivæ, conſecratus eſt.—Nam animal hoc coitus valde cupidum eſt." His principal temple was a magnificent building in a city of Lower Egypt, called after his name. It is well known (ſee POLYTHEISM) that from dedicating certain animals to certain gods, the Egyptians proceeded to conſider the animals themſelves as actuated by the divinities to whom they were ſacred. Hence the origin of brute worſhip. In the temple of Mendes was kept a *he goat*, to whom ſacrifices of a very monſtrous kind were offered. Herodotus, ſpeaking of the præfecture of *Mendes*, ſays †, Εγενετο δ᾽ εν τω νομω τουτω επ᾽ εμευ τουτο το τερας γυναικι τραγος εμισγετο αναφανδον. Τουτο ες επιδειξιν ανθρωπων απικετο. Our readers, learned and unlearned, will forgive us for not tranſlating this paſſage, which contains, however, nothing that is not confirmed by the teſtimony of other writers; particularly Plutarch, and Pindar as he is quoted by Strabo. The moſt wonderful circumſtance of this monſtrous ſacrifice is, that it was made publicly in the preſence of a great concourſe of men! But to what divinity was it made? To a mere goat, or to ſome ſuperior principle animating the goat? Doubtleſs to the latter; for it is ſaid that the fair worſhippers were of the firſt rank, and of unſpotted fame; and that if they had borne a different character, the deity would not have accepted of their devotions.

‡ Pantheon Ægyptiorum.

† Lib. ii. ch. 26.

The deity whom the Egyptians adored by the name of *Mendes*, was no other than the Soul of the Univerſe; for he was their moſt ancient god: and we are told by Plutarch ‡, "That they took the firſt God and the Univerſe for one and the ſame thing." Hence his name Παν among the Greeks: not that either the Greeks or their maſters in theology worſhipped, as the firſt god, mere brute matter, but that ſpirit which they conceived to be coeternal with matter, and to animate all things, making them *one*. Thus Orpheus, who imported the Egyptian doctrine into Greece, declares that all things are one: and after him Parmenidas, and other philoſophers, taught, εν ειναι το παν, that "one is the univerſe;" and that "the univerſe is immoveable." That the ancient Grecian *Pan*, or the Egyptian *Mendes*, was not the corporeal world, as ſenſeleſs and inanimate, but the whole ſyſtem of things, animated and eternal, appears further from the following teſtimony of Macrobius. "Hunc deum Arcades colunt, appellantes τον της υλης κυριον, non ſylvarum dominum, ſed univerſæ ſubſtantiæ materialis dominatorem:—The Arcadians worſhip this god, calling him the lord of HYLE; *i. e.* not the lord of the woods, but the lord of all material ſubſtance." In the ſame manner, Pharnutus † deſcribes the Pan † of the other Greeks, not as the mere corporeal world, but as the intellectual principle actuating it and preſiding over it: and he adds, that "Pan was feigned to be laſcivious, becauſe of the multitude of *ſpermatic reaſons* in the world, and the continual mixtures and generation of things."

Pan.

‡ *De Iſid. et Oſir.*

† *Inter Thom. Gale Script res Mythol. vet.*

The Egyptians, as we learn from Jablonſki, had nearly the ſame notion with the Greeks of the ſpirit which they worſhipped as the Soul of the Univerſe; only they gave to it both ſexes. As the maker, governor, and bountiful father of univerſal nature, they conſidered it as a *male*, whoſe ſymbol was the *he goat* of Mendes; and as a *female* it was adored by the name of *Iſis*, to whom the *ſhe goat* was conſecrated, though not held in ſuch veneration as the male. From this view of the Egyptian creed, the ſacrifice which we have mentioned appears no longer unaccountable. It was made to a god, believed to be the univerſal ſource of fecundity, and to whom, from the well-known character of the animal, whom he was ſuppoſed to actuate, they had reaſon to believe it would be moſt acceptable.

The Greeks never worſhipped their Pan by the emblem of a living goat; but they painted him with the lower parts of a goat, for a reaſon which ſhall be afterwards mentioned. How he came to degenerate among that people, from one of the *Dii majorum gentium* or rather from the firſt principle of all things, to the rank of a demon or demi-god, we cannot pretend to ſay: but that ſuch was his fate, is certain; for under this laſt character mention is made both of his birth and his death.

Whoſe ſon he was, is not agreed among them. Homer makes him the ſon of Mercury, and ſays he was called *Pan* from παν, *omne*, becauſe he charmed all the gods with his flute; others ſay that he was the ſon of Demogorgon, and firſt invented the organ, of ſeven unequal reeds, joined together in a particular manner: Having on a time fought with Cupid, that god in ſpite made him fall in love with the coy nymph Syrinx, who, flying from him to the banks of Ladon, a river of Arcadia, at the inſtant prayers of the Nymphs was turned into a reed, as her name in Greek ſignifies, which the god graſping inſtead of her, made a pipe of it, and for his muſic was adored by the Arcadians. The moſt common opinion was, that he was the ſon of Mercury and Penelope. But *Nat. Comes*, out of *Duris Samius*, makes his birth ſcandalous, by ſaying he was called Παν, becauſe begot by all Penelope's ſuitors. He was painted half man half goat, having large goats horns, a chaplet of pine on his red face, a pleaſant laughter, with the feet and tail of a goat; a motely ſkin covering his body, with a crooked ſtick in one hand and his pipe in the other. See him nicely deſcribed by *Sil. Ital.* 13. 326. *et ſeq.* a fight enough to fright women and children, yea, armed men too; for when Brennus the Gaul was about to pillage the temple of Apollo at Delphos, he by night ſtruck ſuch a terror into his army, that he quitted his ſacrilegious deſign: hence *Panici terrores*. Yet, as homely as he was, he pleaſed the goddeſs Luna, turning himſelf eaſily into a white ram, Virgil, Georg. III. 392. *et deinceps;* and the nymph Dryope alſo, almoſt putting off his divinity, and turning ſhepherd for her ſake. Neither was he diſpleaſing to other nymphs, who are generally made dancing round about him to hear the charms of his pipe. The uſual offerings made him were milk and honey, in ſhepherds wooden bowls; alſo they ſacrificed to him a dog, the wolf's enemy; whence his uſual epithet is Λυκαιος; and whence alſo his prieſts were called *Luperci*.

His feſtival was celebrated on February 15. by the Romans, brought into Italy by Evander the Arcadian, and revived afterwards by Romulus, in memory of his preſerver. He was alſo called by the Romans *Inuus*, ab ineundo. *Vid.* Liv. I. 5. Macrob. Sat. I. 22. and Serv. in Virg. Æn. VI. 775. The ancients, by giving ſo many adjuncts and attributes to this idol as we have obſerved above, ſeem to have deſigned him for the ſymbol of the univerſe; his upper parts being human, becauſe the upper part of the world is fair, beautiful, ſmiling, like his face; his horns ſymbolize the rays of the ſun and of the moon; his red face, the ſplendour of the ſky; the ſpotted ſkin wherewith he is clothed, the ſtars which beſpangle the firmament; the roughneſs of his lower parts, beaſts and vegetables; his goat's feet, the ſolidity of the earth; his pipe, compact of ſeven reeds, the ſeven planets, which they ſay make the harmony of the ſpheres: his crook, bending round at the top, the years circling in one another. *Serv. Interpr.*

Having ſaid ſo much of Pan, both as a ſelf-exiſtent god and as a generated demon, we ſhall conclude the article with ſome obſervations on Plutarch's account of the prodigy which happened at his death; for in the Pagan creed, demons were not all believed immortal.—"In the reign of Tiberius (ſays our author †), certain perſons on a voyage from Aſia to Italy, and ſailing towards the evening by the Echinedes, were there becalmed, and heard a loud voice from the ſhore calling on one Thamus an Egyptian pilot whom they had on board. Thamus, as may be ſuppoſed, liſtened with attention; and the voice, after repeating his name thrice, commanded him when he came to the Pelodes, to declare that the *Great Pan* was dead. The man, with the advice of his companions, reſolved, that if they ſhould have a quick gale off the Pelodes, he would paſs by in ſilence; but that if they ſhould be becalmed, he would perform what the voice had commanded. Adhering to this reſolution, they ſoon arrived off the deſtined iſlands, and were immediately becalmed, there being neither breath of wind nor agitation of water. Upon this Thamus looking from the hinder part of the ſhip towards the land, pronounced with a loud voice ὁ μεγας Παν τεθνηκε, *The Great Pan is dead!* and was inſtantly anſwered from the ſhore by numberleſs howlings and lamentations.

This ſtory, which has ſo much the air of impoſture, has not only been admitted as truth by men of the firſt eminence for learning and acuteneſs, but has been applied to our Saviour, whoſe death (ſays Cudworth) the demons mourned, not from love, but from a preſage that it would put a period to the tyranny and domination which they had ſo long exerciſed over the ſouls and bodies of men. In ſupport of this opinion, he quotes ſeveral paſſages of Scripture, ſuch as, "Now is the prince of this world judged;" and, "Having ſpoiled principalities and powers (by his death upon the croſs), he triumphed over them in it." He affirms likewiſe, that "Pan being taken for that reaſon or underſtanding by which all things were made, and by which they are all governed, or for that divine wiſdom which diffuſeth itſelf through all things, is a name which might very well ſignify *God manifeſted in the fleſh*.

The authority of Cudworth is great; but a groundleſs opinion has ſeldom been propped by weaker reaſoning than he makes uſe of on this occaſion. Plutarch indeed ſays, and ſeems to believe, that this prodigy fell out during the reign of Tiberius; but as he mentions not the year of that reign, there is no evidence that it was at the crucifixion of our Saviour. The demons who inhabited the Echinedes knew what had been tranſacted at Jeruſalem far diſtant from their iſlands; they knew the name of the pilot of a ſtrange ſhip; they knew that the mariners of that ſhip had reſolved to diſobey their command, unleſs becalmed off the Pelodes; they had power over both the winds and waves at the *Pelodes*, and exerted that power to enforce obedience to their command; and yet theſe all-knowing and powerful beings were under the neceſſity of calling in the aid of a *man* to deliver a meſſage to their companions, inhabiting a place to which the very ſame ſtory aſſures us that their own power and knowledge reached. Should it be ſaid that the demons were compelled by divine power thus publicly to make known to man Chriſt's triumph over the kingdom of darkneſs, we beg leave to aſk why they were not likewiſe compelled to give him another name, ſince it is certain, that at the era of Tiberius, and long before, illiterate Pagans, ſuch as common ſeamen muſt be ſuppoſed to have been, knew no other *Pan* than the fabled ſon of Penelope and Mercury?—Indeed the other Pan, taken for that reaſon or underſtanding by which all things were made, could not poſſibly be the being here meant; for, erroneous as the Pagan ſyſtem was, there is nothing in it ſo completely abſurd as the death of the ſoul of the univerſe, the maker of all things; nor do we believe that any Pagan ever exiſted, who dreamed that ſuch a death was poſſible.

What then, it will be aſked, are we to underſtand by

† *Lib. de Orac. Def.*

by this ſtory? Plutarch was eminent for knowledge and integrity, and he relates it without expreſſing a doubt of its truth. He does ſo; but many a man of worth has been credulous; and though that was not his character, this *prodigy* may be accounted for by natural means. Germanicus was believed to have been poiſoned, at leaſt with the knowledge, if not by the command, of Tiberius; and there was nothing which the Romans ſo deeply deplored as the untimely death of that accompliſhed prince[‡]. They fancied that his body was animated, not by a human ſoul, but by a ſuperior demon; and they decreed to him ſtatues, religious ceremonies, and even ſacrifices. His widow was highly honoured, as having been nearly related to a divinity, and his children were adored as demi-gods. Theſe facts being admitted, nothing appears to us more probable than the opinion of the learned Moſheim[†], who thinks that ſome ſhrewd ſtateſmen, in order to excite the popular fury againſt Tiberius to the higheſt pitch, invented this ſtory, and bribed foreign mariners to ſpread it among the people, who would naturally believe, that by the great Pan was meant their favourite Germanicus. This hypotheſis is at leaſt countenanced by what Plutarch tells us of the anxiety of the emperor to diſcover what perſonage could be meant by the Pan whoſe death was announced to the ſeamen: he conſulted the learned men of Rome, who, in order to reſtore peace to the city, declared that they underſtood it of none other than the ſon of Penelope and Mercury.

PANACEA, among phyſicians, denotes an univerſal medicine, or a remedy for all diſeaſes; a thing impoſſible to be obtained.

PANADA, a diet conſiſting of bread boiled in water to the conſiſtence of pulp, and ſweetened with a little ſugar.

PANAMA, the capital city of the province of Darien in South America, where the treaſures of gold and ſilver, and the other rich merchandiſes of Peru, are lodged in magazines till they are ſent to Europe. W. Long. 82. 15. N. Lat. 8. 57.

When Guzman firſt touched at this place in 1514, it conſiſted entirely of fiſhermen's huts. Orius d'Avila ſettled a colony here in a few years after, and in 1521 it was conſtituted a city by the emperor Charles V. with the proper privileges. In 1670 it was ſacked and burnt by John Morgan, an Engliſh adventurer, who had the preceding year taken Porto Bello. This misfortune induced the inhabitants to remove the city to its preſent ſituation, diſtant about a league from the place where it ſtood before. For the greater ſecurity, the new city was encloſed by a freeſtone wall, and the houſes were built of ſtone and brick. Since that time ſeveral baſtions have been added, and now there is always a complete garriſon maintained, and the walls are mounted with large cannon. But all theſe precautions could not ſave this city from another misfortune; it was entirely conſumed by fire in the year 1737. After this accident it was again rebuilt, in the manner as it now ſtands, with neat elegant houſes, but not magnificent. The inhabitants are rather independent in their fortunes than rich; there are few of them opulent, and ſcarce any in a ſtate of poverty. As to the harbour, it is convenient, and well ſecured againſt ſtorms by a number of ſurrounding iſlands, and is capable of containing the largeſt fleets. Here the royal audience is ſeated, at which the governor of Panama reſides; for which reaſon the city is commonly deemed the capital of the province.

This place, a little while after it was founded, became the capital of the kingdom of Terra Firma. Some hopes were at firſt entertained from the three provinces of Panama, Darien, and Veragua, which compoſed it; but this proſperity vaniſhed inſtantaneouſly. The ſavages of Darien recovered their independence; and the mines of the two other provinces were found to be neither ſufficiently abundant, nor of an alloy good enough to make it worth while to work them. Five or ſix ſmall boroughs, in which are ſeen ſome Europeans quite naked, and a very ſmall number of Indians who have come to reſide there, form the whole of this ſtate, which the Spaniards are not aſhamed of honouring with the great name of kingdom. It is in general barren and unwholeſome, and contributes nothing to trade but pearls.

The pearl fiſhery is carried on in the iſlands of the gulf. The greateſt part of the inhabitants employ ſuch of their negroes in it as are good ſwimmers. Theſe ſlaves plunge and replunge in the ſea in ſearch of pearls, till this exerciſe has exhauſted their ſtrength or their ſpirits.

Every negro is obliged to deliver a certain number of oyſters. Thoſe in which there are no pearls, or in which the pearl is not entirely formed, are not reckoned. What he is able to find beyond the ſtipulated obligation, is conſidered as his indiſputable property: he may ſell it to whom he pleaſes; but commonly he cedes it to his maſter at a moderate price.

Sea monſters, which abound more about the iſlands where pearls are found than on the neighbouring coaſts, render this fiſhing dangerous. Some of theſe devour the divers in an inſtant. The manta fiſh, which derives its name from its figure, ſurrounds them, rolls them under its body, and ſuffocates them. In order to defend themſelves againſt ſuch enemies, every diver is armed with a poniard: the moment he perceives any of theſe voracious fiſh, he attacks them with precaution, wounds them, and drives them away. Notwithſtanding this, there are always ſome fiſhermen deſtroyed, and a great number crippled.

The pearls of Panama are commonly of a very fine water. Some of them are even remarkable for their ſize and figure: theſe were formerly ſold in Europe. Since art has imitated them, and the paſſion for diamonds has entirely ſuperſeded or prodigiouſly diminiſhed the uſe of them, they have found a new mart more advantageous than the firſt. They are carried to Peru, where they are in great eſtimation.

This branch of trade has, however, infinitely leſs contributed to give reputation to Panama, than the advantage which it hath long enjoyed of being the mart of all the productions of the country of the Incas that are deſtined for the old world. Theſe riches, which are brought hither by a ſmall fleet, were carried, ſome on mules, others by the river Chagre, to Porto Bello, that is ſituated on the northern coaſt of the iſthmus which ſeparates the two ſeas. See DARIEN.

PANARI, one of the Lipari iſlands, lying in the Tuſcan ſea. It is only five miles in circumference, and the ſoil is barren. E. Long. 15. 0. N. Lat. 39. 0.

[‡] *Tacit. Annal.* Lib. II. cap. 72. 83. et Lib. III. cap. 1.

[†] *Cudworth's Intel. Syſt.* cap. 4. note 13

PANARO, a river of Italy, which riſes in the Apennines, croſſes the valley of Frignano, and running on the confines of the Modeneſe and Bologneſe, waters Fenal, and falls into the Po at Bondeno, ten miles above Ferrara.

PANATHENÆA, παναθηναια, in Grecian antiquity, an ancient Athenian feſtival, in honour of Minerva the protectreſs of Athens, and called *Athenæa*. Harpocration and Suidas refer the inſtitution of this feſtival to Erichthonius IV. king of Athens, who lived before Theſeus. Theodoret alone ſays the feaſt was eſtabliſhed by Orpheus. Be this as it will, till Theſeus it was only a particular feaſt of the city of Athens, and was ſimply called *Athenæa*: but that prince, uniting all the people of Attica into one republic, they afterwards all aſſiſted at the feaſt; whence the name *Panathenæa*, i. e. the feaſt of all Attica. In effect all Attica was preſent; and each people ſent a bullock for the ſacrifices, and for the entertainment of the vaſt multitude of people aſſembled.

There were two feſtivals under this denomination, the greater and the leſſer. The greater panathenæa were exhibited every five years; the leſs every three, or, according to ſome writers annually. Though the celebration of neither, at firſt, employed more than one day: yet in aftertimes they were protracted for the ſpace of many days, and ſolemnized with greater preparations and magnificence than at their firſt inſtitution.

The ceremonies were the ſame in the great and the little panathenæa; excepting for a banner, wherein the actions of the goddeſs were repreſented in embroidery, performed by maids, with the names of thoſe who had diſtinguiſhed themſelves in the ſervice of the republic: which was only borne at the greater.

Prizes were eſtabliſhed there for three different kinds of combat: the firſt conſiſted of foot and horſe races; the ſecond, of athletic exerciſes; and the third, of poetical and muſical conteſts. Theſe laſt are ſaid to have been inſtituted by Pericles. Singers of the firſt claſs, accompanied by performers on the flute and cithara, exerciſed their talents here, upon ſubjects preſcribed by the directors of theſe exhibitions.

The following is the order obſerved in this feſtival, according to M. Barthelemi, who quotes numerous authorities on the occaſion: "The inhabitants of the different towns of Attica thronged to the capital, leading with them a great number of victims deſtined for ſacrifices to the goddeſs. In the firſt morning were the horſe races, in which the ſons of the firſt citizens of Athens contended for the honour of the victory. In the ſtadium were other young men ſtruggling for the prize of wreſtling, and different exerciſes of the body; and in the Odium were ſeveral muſicians engaged in gentler and leſs perilous conteſts. Some executed pieces on the flute or cithara; others ſang, and accompanied their voices with one of theſe inſtruments. The ſubject propoſed to them was the eulogium of Harmodius, Ariſtogiton, and Thraſybulus, who had reſcued the republic from the yoke of the tyrants by which it was oppreſſed: for among the Athenians, public inſtitutions are ſo many monuments for the citizens who have ſerved the ſtate, and leſſons for thoſe who are called upon to render it ſervice. A crown of olive, and a veſſel filled with oil, were the prizes beſtowed upon the victors. Crowns were afterwards conferred on individuals, who appeared to the people to have merited that mark of honour by their zeal in the ſervice of their country.

Anacharſis, Vol. II. p. 434.

"At the Ceramicus paſſed a proceſſion, formed without the walls, and which began at that a place to file off. It was compoſed of different claſſes of citizens crowned with chaplets of flowers, and remarkable for their perſonal beauty. Among the number were old men of a majeſtic and venerable appearance, bearing branches of olive; middle aged men, who, armed with lances and with bucklers, ſeemed only to reſpire war; youth from eighteen to twenty, who ſang hymns in honour of the goddeſs; beautiful boys clad in a ſimple tunic, adorned only with their native graces; and, laſtly, girls who were of the firſt families in Athens, and whoſe features, ſhape, and deportment, attracted every eye. With their hands they held baſkets on their heads, which, under a rich veil, contained ſacred utenſils, cakes, and every thing neceſſary for the ſacrifices. Female attendants who followed them, with one hand held over them an umbrella, and carried in the other a folding chair. This is a ſpecies of ſervitude impoſed on the daughters of all foreigners ſettled at Athens; a ſervitude they ſhare in common with their fathers and mothers, who likewiſe carried on their ſhoulders veſſels filled with water and honey, for the purpoſe of libations. They were followed by eight muſicians; four of whom played on the flute and four on the lyre. After them came rhapſodiſts ſinging the poems of Homer; and dancers armed at all points, who, attacking each other at intervals repreſented to the ſound of the flute, the battle of Minerva with the Titans. Next came a ſhip that appeared to glide over the ground by the power of the wind, and the efforts of a great number of rowers, but which really was put in motion by concealed machinery. The veſſel had a ſail of light ſtuff, on which young girls had repreſented in embroidery the victory of Minerva over the Titans. On it alſo they had depicted, by order of the government, ſome heroes whoſe illuſtrious deeds had merited to be celebrated with thoſe of the gods. This proceſſion marched on with ſolemn ſteps, under the direction of ſeveral magiſtrates; and traverſed the moſt frequented quarter of the city amidſt a crowd of ſpectators, moſt of whom were placed on ſcaffolds erected for the occaſion. When it had reached the temple of the Pythian Apollo, the ſail of the ſhip was taken down and carried to the citadel, where it was depoſited in the temple of Minerva.

"In the evening, at the academy, was the torch race. The courſe is only ſix or ſeven ſtadia in length. It extends from the altar of Prometheus, which is at the gate of this garden, to the walls of the city. Several young men are ſtationed in this interval at equal diſtances. When the ſhouts of the multitude have given the ſignal, the firſt lights his flambeau at the altar, and, running with it, hands it to the ſecond, who tranſmits in the ſame manner to the third, and ſo ſucceſſively. He who ſuffers it to be extinguiſhed can no more enter the liſts; and they who ſlacken their pace are expoſed to the railleries, and even blows, of the populace. To gain the prize, it is neceſſary to have paſſed through the different ſtations with ſucceſs. This trial of ſkill was frequently repeated, and is diverſified according to the nature of the feſtivals.

"The candidates who had been crowned at the different exerciſes invited their friends to ſupper. Sumptuous repaſts were given in the prytaneum and other public places, which laſted till the following day. The people among whom the immolated victims were diſtributed ſpread tables on every ſide, and gave a looſe to their lively and tumultuous mirth."

PANAX, Ginseng: A genus of the diœcia order, belonging to the polygamia claſs of plants. There are five ſpecies of this plant. 1. Quinquefolium. 2. Trifolium. 3. Fruticoſum. 4. Arborea. 5. Spinoſa.

Plate CCCLXXIII.

The firſt and ſecond are natives of North America. The quinquefolium is generally believed to be the ſame with the Tartarian ginſeng; the figures and deſcriptions of that plant which have been ſent to Europe by the miſſionaries agreeing perfectly with the American plant. This hath a jointed, fleſhy, and taper root, as large as a man's finger, frequently divided into two ſmaller fibres downwards. The ſtalk riſes near a foot and a half high, and is naked at the top, where it generally divides into three ſmaller footſtalks, each ſuſtaining a leaf compoſed of five ſpear-ſhaped lobes, ſawed on their edges: they are of a pale green, and a little hairy. The flowers grow on a ſlender footſtalk, juſt at the diviſion of the footſtalks which ſuſtain the leaves, and are formed into a ſmall umbel at the top: they are of a herbaceous yellow colour, compoſed of ſmall yellow petals, which are recurved. Woodville † ſays they are white; that they are produced in a roundiſh terminal umbel, and are hermaphrodite or male on ſeparate plants. The former (ſee the Plate) ſtand in cloſe ſimple umbels: the involucrum conſiſts of ſeveral ſmall, tapering, pointed, permanent leaves; the proper calyx is tubular, and divided at the rim into five ſmall teeth: the corolla conſiſts of five petals, which are ſmall, oval, equal, and reflexed: the filaments are five, ſhort, and furniſhed with ſimple antheræ: the germen is roundiſh, placed below the corolla, and ſupports two ſhort erect ſtyles, crowned by ſimple ſtigmata: the fruit is an umbilicated two-celled berry, each containing a ſingle irregularly heart-ſhaped ſeed. The flowers appear in the beginning of June; and are ſucceeded by compreſſed, heart-ſhaped berries, which are firſt green, but afterwards turn red; encloſing two hard, compreſſed, heart-ſhaped ſeeds, which ripen in the beginning of Auguſt. The ſecond ſort grows naturally in the ſame countries: but Mr Miller never ſaw more than one plant, which was ſent to him from Maryland, and did not live beyond the firſt year: being planted in a dry ſoil, in a very dry ſeaſon. The ſtalk was ſingle, and did not riſe more than five inches in height dividing into three footſtalks, each ſuſtaining a trifoliate leaf, whoſe lobes were longer, narrower, and deeper indented on their edges, than the former. The flower ſtalk roſe from the diviſions of the footſtalk of the leaves; but before the flowers opened, the plant decayed.

† Medical Botany.

Woodville's Medical Botany, Vol. II.

Ginſeng was formerly ſuppoſed to grow only in Chineſe Tartary, affecting mountainous ſituations, ſhaded by cloſe woods; but it has now been long known that this plant is alſo a native of North America, whence M. Sarraſin tranſmitted ſpecimens of it to Paris in the year 1704 (A); and the ginſeng ſince diſcovered in Canada, Pennſylvania, and Virginia, by Lafiteau, Kalm, Bartram, and others, has been found to correſpond exactly with the Tartarian ſpecies; and its roots are now regularly purchaſed by the Chineſe, who conſider them to be the ſame as thoſe of eaſtern growth, which are known to undergo a certain preparation, whereby they aſſume an appearance ſomewhat different. For it is ſaid, that in China the roots are waſhed and ſoaked in a decoction of rice or millet ſeed, and afterwards expoſed to the ſteam of the liquor, by which they acquire a greater firmneſs and clearneſs than in their natural ſtate (B). The plant was firſt introduced into England in 1740 by that induſtrious naturaliſt Peter Collinſon. It thrives in thoſe places where it hath a light ſoil and ſhady ſituation, and will produce flowers and ſeeds; but the latter, though in appearance ripe and perfect, will not produce any new plants, as Mr Miller ſays he has repeatedly made the experiment, and waited for them three years without diſturbing the ground. There are many good ſpecimens in the Royal Botanic Garden at Kew.

The dried root of ginſeng, as imported here, is ſcarcely the thickneſs of the little finger, about three or four inches long, frequently forked, tranſverſely wrinkled, of a horny texture, and both internally and externally of a yellowiſh white colour. On the top are commonly one or more little knots, which are the remains of the ſtalks of the preceding years, and from the number of which the age of the root is judged of. "To the taſte it diſcovers a mucilaginous ſweetneſs, approaching to that of liquorice, accompanied with ſome degree of bitteriſhneſs, and a ſlight aromatic warmth, with little or no ſmell. It is far ſweeter, and of a more grateful ſmell, than the roots of fennel, to which it has by ſome been ſuppoſed ſimilar; and differs likewiſe remarkably from thoſe roots in the nature and pharmaceutic properties of its active principles, the ſweet matter of the ginſeng being preſerved entire in the watery as well as the ſpirituous extract, whereas that of fennel roots is deſtroyed or diſſipated in the inſpiſſation of the watery tincture. The ſlight aromatic impregnation of the ginſeng is likewiſe in good meaſure retained in the watery extract, and perfectly in the ſpirituous ‡."

‡ Lewis, [illegible] p. 325

Properties, The Chineſe aſcribe extraordinary virtues to the root of ginſeng; and have long conſidered it as a ſovereign remedy in almoſt all diſeaſes to which they are liable, having no confidence in any medicine unleſs in combination with it. It is obſerved by Jartoux,

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(A) Sarraſin was correſpondent of the Royal Academy of Sciences, in the hiſtory of which his account was publiſhed in 1718.

(B) The Chineſe value theſe roots in ſome meaſure according to their figure, eſteeming thoſe very highly which are regularly forked, or have a fancied reſemblance to the human form.

toux, that the moſt eminent phyſicians in China have written volumes on the medicinal powers of this plant; aſſerting, that it gives immediate relief in extreme fatigue either of body or mind; that it diſſolves pituitous humours, and renders reſpiration eaſy; ſtrengthens the ſtomach; promotes appetite; ſtops vomitings; removes hyſterical, hypochondriacal, and all nervous affections; and gives a vigorous tone of body even in extreme old age. Theſe, and many other effects of this root equally improbable and extravagant, are related by various authors; and Jartoux was ſo much biaſſed by this eaſtern prejudice in favour of ginſeng, that he ſeems to have given them full credit, and confirms them in ſome meaſure from his own experience. He ſays, "Nobody can imagine that the Chineſe and Tartars would ſet ſo high a value upon this root, if it did not conſtantly produce a good effect."—"I obſerved the ſtate of my pulſe, and then took half of that root raw: in an hour after I found my pulſe much fuller and quicker; I had an appetite, and found myſelf much more vigorous, and could bear labour much better and eaſier than before. But I did not rely on this trial alone, imagining that this alteration might proceed from the reſt we had that day: but four days after, finding myſelf ſo fatigued and weary that I could ſcarcely ſit on horſeback, a Mandarin who was in company with us perceiving it, gave me one of theſe roots: I took half of it immediately, and an hour after I was not the leaſt ſenſible of any wearineſs. I have often made uſe of it ſince, and always with the ſame ſucceſs. I have obſerved alſo, that the green leaves, and eſpecially the fibrous parts of them, chewed, would produce nearly the ſame effect †." We know, however, of no proofs of the efficacy of ginſeng in Europe; and from its ſenſible qualities we judge it to poſſeſs very little power as a medicine. Dr Cullen ſays, "We are told that the Chineſe conſider ginſeng as a powerful aphrodiſiac; but I have long neglected the authority of popular opinions, and this is one inſtance that has confirmed my judgment. I have known a gentlemen, a little advanced in life, who chewed a quantity of this root every day for ſeveral years, but who acknowledged he never found his faculties in this way improved by it ‡."

A dram of the ginſeng root may be ſliced and boiled in a quarter of a pint of water to about two ounces; then a little ſugar being added, it may be drank as ſoon as it is cool enough. The doſe muſt be repeated morning and evening; but the ſecond doſe may be prepared from the ſame portion of root which was uſed at firſt, for it may always be twice boiled.

PANAY, an iſland of Aſia, and one of the Philippines, lying between thoſe of Paragoa and Negro. It is 250 miles in circumference, and is the moſt populous and fertile of them all. It is watered by a great number of rivers and brooks, and produces a great quantity of rice. Its ſhape is triangular. The names of its principal capes are Potol, Naſo, and Bulacabi. The coaſt from Bulacabi to Potol lies eaſt and weſt; from Potol to Naſo, north and ſouth; from Bulacabi to Iloilo, another cape, leſs than the great ones, is alſo north and ſouth; from Iloilo to Cape Naſo, eaſt and weſt. The middle of the iſland is in the latitude of ten degrees. On the north ſide, almoſt in the middle between the two capes of Potol and Bulacabi, the famous river Panay falls into the ſea; and the mouth of the harbour is covered by a ſmall iſland called *Lutaya*, in which port the Spaniards had a ſafe retreat before they diſcovered and conquered Manilla and Gavité. The fertility of Panay is cauſed by the many rivers that water it, for there is no travelling a league without meeting a river; but more particularly by the Panay, which gives its name to the iſland, and runs a courſe of 40 leagues. The iſland, for the better adminiſtering of juſtice, is divided into juriſdictions: the firſt, called *Panay*, contains all that lies between Cape Potol and Bulacabi; the reſt of the iſland is ſubject to the alcayde of Otton, who reſides at Iloilo, a point of land running out into the ſea, on the ſouth ſide, between the two rivers of Tig Bavan and Jaro, and, with the iſland Imaras, forms a ſtrait not above half a league over, or rather an open harbour. On this point the governor Don Gonzalo Ronquillo cauſed a fort to be built in the year 1681. The iſland contains about 16,360 tributary Indians, partly belonging to the king and partly to particular encomienderos or lords; but they all pay in rice, the iſland producing 100,000 buſhels, Spaniſh meaſure, and but little other grain. The inhabitants are ſtout, luſty, and induſtrious farmers, and expert huntſmen, the country being full of wild boars and deer. The women make cloth of ſeveral colours. There are in the iſland 14 pariſhes, belonging to the fathers of the order of St Auguſtin, three benefices of ſecular prieſts, and formerly one college of the ſociety of Jeſus, where they adminiſter the ſacraments to the garriſon of Iloilo. Beſides the tributary Indians, there are here thoſe blacks the Spaniards call *Negrilloes*, who were the firſt inhabitants of the iſland, and afterwards driven into the thick woods by the Biſayas who conquered it. Their hair is not ſo ſtiff curled, nor are they ſo ſtout and ſtrong, as the Guinea blacks. They live in the moſt uncouth parts of the mountains with their wives and children, all naked like beaſts. They are ſo ſwift that they often overtake wild boars and deer. They ſtay about the dead beaſt as long as it laſts; for they have no other ſubſiſtence but what they acquire with their bow and arrows. They fly from the Spaniards, not ſo much through hatred as from fear. Among the iſlands about Panay lies Imaras, oppoſite to Iloilo, and about a quarter of a league diſtant. It is long and low, ten leagues in compaſs and three in length, the ſoil fertile, abounding in ſarſaparilla, and exceeding good water. On the mountains there are wild boars, deer, and good timber. It has alſo in it the port of St Anne, three leagues from Iloilo.

PANCARPUS, in Roman antiquity, a kind of ſhow which the Roman emperors frequently exhibited to the people. The word is formed from the Greek παν *all*, and καρπος *fruit*. Whence the name was alſo given by the Athenians to a ſacrifice wherein all kinds of fruits were offered. In this ſpectacle, the Circus being all ſet over with large trees, repreſented a foreſt, into which the beaſts being let from the dens underground, the people, at a ſign given by the emperor, purſued, ſhot, and killed all they could lay hold of, which they afterwards carried away, to regale upon at home. The beaſts uſually given on theſe occaſions were boars, deer, oxen, and ſheep.

Caſaubon, Cujas, Pithou, &c. make the pancarpus and ſylva the ſame thing; Salmaſius will have them different. The ſylva, according to him, was ſuch a diverſion as that above deſcribed: but the pancarpus a combat, wherein robuſt people, hired for that purpoſe, fought with wild beaſts: which opinion he confirms from Caſſian, Juſtinian, Claudian, Firmicus, Manilius, and Caſſiodorus.

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† Phil. Tranſ. Vol. xxviii p. 239.

‡ Mat. Med. Vol. ii p. 161.

Modern Un. Hiſt. Vol. viii.

PANCIROLLUS (Guy), a famous lawyer of Rhegium, was a perſon of an excellent genius, which he cultivated with the greateſt care in the principal univerſities of Italy; and was afterwards ordinary profeſſor of law at Padua. Philibert Emanuel, duke of Savoy, invited him to his univerſity in 1571, where he compoſed his ingenious treatiſe *De rebus inventis et deperditis*. But the air of Turin not agreeing with him, he there loſt an eye; and for fear of loſing the other, returned to Padua, where he died in 1591.

PANCRAS, a town of England, in the county of Middleſex, on the north-weſt ſide of London, in the highway to Kentiſh town. Its church is one of the prebends of St Paul's, of which cathedral ſome call it the mother, it being thought to be as old as that church even in the reign of Queen Elizabeth, when it is repreſented as weather-beaten and ſtanding alone, without any company, though it had formerly many buildings about it. In its churchyard lie many Roman Catholics. At a public houſe on the ſouth ſide of the church is a medicinal ſpring.

PANCRATIUM (compounded of *παν all*, and *κρατιω I overcome)*, among the ancients, a kind of intermixed exerciſe, conſiſting of the lucta or wreſtling, and the boxing or pugilate: but it differs in this, that as the athletæ are not to ſeize the body, their hands are not armed with gauntlets, and give leſs dangerous blows.

The *pancratium* was the third gymnaſtic exerciſe, and was not introduced till long after the others. The people who were engaged in theſe exerciſes were called *pancratiaſtæ;* which name was alſo given to ſuch as did not confine themſelves to one exerciſe, but ſucceeded in ſeveral different ones.

Anacharſis, Vol. III.

Barthelemi, in his Travels of Anacharſis, gives us a ſhort account of one of thoſe at which he ſuppoſes him to have been preſent, in theſe words: "The action was ſoon terminated: a Sicyonian named *Soſtratus*, a champion celebrated for the number of prizes he had won, and the ſtrength and ſkill which had procured them, had arrived the preceding day. The greater part of the combatants yielded up all pretenſions to the crown as ſoon as he appeared, and the others on the firſt trial; for in thoſe preliminary eſſays, in which the athletæ try their ſtrength by taking each others hands, he ſqueezed and twiſted the fingers of his adverſaries with ſuch violence as inſtantly to decide the victory in his favour."

PANCREAS, in anatomy. See there, N° 95.

PANDA, in mythology, a goddeſs who was invoked and honoured as the protectreſs of travellers and navigators. The goddeſs of peace was alſo called *Pandar*, becauſe ſhe opened the gates of cities which were ſhut in time of war. According to Varro, Panda is a ſurname of Ceres, derived *à pane dando*, becauſe ſhe gave bread to mankind.

PANDATARIA (Suetonius, Pliny, Strabo); PANDATERIA (Mela, Tacitus): An iſland in the Tuſcan ſea: a place of baniſhment for the more illuſtrious exiles. Hither Julia, the daughter of Auguſtus, was baniſhed for her incontinence. To this iſland Tiberius baniſhed Agrippina, his daughter-in-law (Suetonius). It was the place of confinement of Octavia the daughter of Clodius, married to Nero; a ſight that affected every eye (Tacitus). Now *Santa Maria*, ſituated between Pontia and Iſchia (Holſtenius).

PANDECTS, PANDECTÆ, in juriſprudence, the digeſt or collection, made by Juſtinian's order, of 534 deciſions or judgments of the ancient lawyers, on ſo many queſtions occurring in the civil law; to which that emperor gave the force and authority of law, by the epiſtle prefixed to them.—The word is Greek, Πανδεκται, compounded of *παν* "all", and *δεχομαι capio*, "I take;" *i. e.* a compilation, or a book containing all things. Though others, as Bartoli, will have it formed from *παν*, and *δεχομαι;* as if theſe books contained the whole doctrine of the civil law.

The Pandects conſiſt of 50 books, and make the firſt part of the body of the civil law.

They were denoted by two *ππ;* but the copyiſts taking thoſe *ππ* for *ff*, the cuſtom aroſe of quoting them by *ff*.

In the year 1137, the Pandects of Juſtinian, which had been brought by an Amalfitan merchant from the eaſt, fell into the hands of the Piſans. Angelus Politianus believes this copy to be that which had been compiled by order of the emperor. However that be, it is certain that all other copies are taken from it, as being the moſt ancient. The Piſans having obtained their requeſt from the emperor, carried the volumes to Piſa, and for near three centuries they were known by the name of the *Pandectæ Piſanæ*. But, about the year 1416, Piſa being taken by the Florentines, they were tranſported from thence to Florence, where they are now preſerved in the library of the Medici, and known by the name of the *Pandectæ Florentinæ*. Some authors allege, that Lotharius ordained by an edict that the Pandects ſhould be publicly read and explained at Bologna, and pleaded in the tribunals; but Corringius and Lindenbrogius fully refute their opinion.

Papias extends the denomination of *Pandects* to the Old and New Teſtament.

There are alſo *PANDECTA Medicinæ*, "Pandects of Medicine;" a kind of dictionary of things relating to medicine, compiled by Mat. Sylvaticus of Mantua, who lived about the year 1297. Leunclavius has publiſhed *Pandects of Turkey;* and Biſhop Beveridge, *Pandecta canonum.*

PANDICULATION, a ſtretching; or that violent and extenſive motion of the ſolids, which uſually accompanies the act of yawning.

PANDORA, in fabulous hiſtory, a woman formed by Prometheus, to whom each of the gods gave ſome perfection. Venus beſtowed upon her beauty; Pallas, wiſdom; Juno, riches; Apollo, muſic; and Mercury, eloquence: but Jupiter being diſpleaſed at Prometheus for having ſtolen fire from heaven to animate the maſs he had formed, gave Pandora a box, which ſhe was ordered not to open; and then ſent her to the earth with this box, in which were encloſed age, diſeaſes, peſtilence, war, famine, envy, diſcord, and all the evils and vices that could afflict mankind. This fatal box was opened by Epimetheus, Prometheus's brother, when inſtantly all the diſeaſes and miſchiefs with which it was filled ſpread over the earth, and Hope only remained at the bottom. Heſiod ſays ſhe was the firſt woman.

PANDOURS, are Hungarian infantry: they wear a looſe garment fixed tight to their bodies by a girdle, with great ſleeves, and large breeches hanging down to their ancles. They uſe fire arms, and are excellent markſmen: they have alſo a kind of ſabre near four feet long, which they uſe with great dexterity.

PANDOSIA (Livy, Juſtin, Strabo), an inland town of the Bruttii, and a place of ſtrength on the river Acheron, where Alexander of Epirus, deceived by the oracle of Dodona, met his fate and periſhed. Now *Mendicino* (Holſtenius). Another of Epirus (Strabo); ſituated on the river Acheron (Livy); which Alexander of Epirus was adviſed to avoid as fatal, but which he met with in Italy. This laſt is ſaid to have been the reſidence of the Œnotrian kings, (Strabo).

PANDURA, or Pandoron, a muſical inſtrument, uſed among the ancients, reſembling the lute. The word is ſaid to be formed from the Greek παν and δωρον, i. e. "all gifts, all ſorts of gifts." Iſidore derives the name from its inventor *Pandorus;* others from *Pan*, to whom they attribute its invention, as well as that of the flute. It has the ſame number of ſtrings with the lute; but they are of braſs, and of conſequence give a more agreeable ſound than thoſe of the lute. Its frets are of copper, like thoſe of the ciſtre; its back is flat, like thoſe of the guitar; and the rims of its table, as well as its ribs, are cut in ſemicircles. Du Cange obſerves, that Varro, Iſidore, and others of the ancients, mention it as having only three ſtrings; whence it is ſometimes alſo ſpoken of under the denomination τριχορδον, *trichordum.*

PANEAS (Pliny, Joſephus): the apparent ſpring from which the Jordan riſes, on the extremity of the weſt ſide of the Trachonitis (Pliny).

Paneas (Coins, Pliny, Joſephus), the name of a diſtrict adjoining to the ſpring *Paneas*, with a cognominal town, either enlarged and adorned, or originally built, by Philip ſon of Herod, and called *Cæſarea* by Joſephus; and in St Matthew, *Cæſarea of Philip;* with a temple erected to Auguſtus his benefactor, who conferred the Trachonitis upon him (Coin). It was afterwards called *Neronias*, in honour of Nero (Joſephus).

PANEGYRIC, an oration in praiſe of ſome extraordinary thing, perſon, or virtue.

The name is Greek, πανηγυρις; formed of παν "all," and αγειρω "I aſſemble;" becauſe anciently held in public and ſolemn aſſemblies of the Greeks, either at their games, their feaſts, fairs, or religious meetings.

To make their panegyrics the more ſolemn, the Greeks uſed to begin with the praiſes of the deity in whoſe honour the games, &c. were celebrated; then they deſcended to the praiſe of the people or country where they were celebrated; then to the princes or magiſtrates who preſided at them; and at length to the champions, eſpecially the conquerors, who had gained the prizes in them.

PANEGYRICUM, in church hiſtory, an eccleſiaſtical book, uſed by the Greek church, containing the panegyrical orations of various authors, on the ſolemnities of Jeſus Chriſt and the ſaints. It is found in MS. in moſt churches, but it is not the ſame in all; each church having its particular ſaints; and the compilers of this kind of books uſually ſuited their collections to the taſte of their own devotion. They are diſpoſed according to the order of the months, and frequently conſiſt of twelve volumes, anſwering to the twelve months of the year.

Among the principal authors of this work are Athanaſius, Cyril, Baſil, Chryſoſtom, &c.

PANEL (*Panella, Panellum*), according to Sir Edward Coke, denotes "a little part;" but the learned Spelman ſays, that it ſignifies *ſchedula vel pagina*, "a ſchedule or roll;" as a panel of parchment, or a counterpane of an indenture: but it is uſed more particularly for a ſchedule or roll, containing the names of ſuch jurors as the ſheriff returns to paſs upon any trial. And the *impanelling* a jury is the entering their names in a panel or little ſchedule of parchment.

Panel, in Scots law, ſignifies the priſoner at the bar, or perſon who takes his trial before the court of juſticiary for ſome crime.

Plate CCCLXXIV.

PANGOLIN, a ſpecies of the manis peculiar to Hindoſtan. It is certainly a remarkable variety, if not a different ſpecies, of the pangolin of Buffon. According to a paper in the firſt volume of the Aſiatic Reſearches, "it has hardly any neck: and, though ſome filaments are diſcernible between the ſcales, they can ſcarce be called briſtles. But the principal difference is in the tail; that of Buffon's animal being long, and tapering almoſt to a point; while that of ours is much ſhorter, ends obtuſely, and reſembles in form and flexibility the tail of a lobſter. In other reſpects it ſeems to have all the characters of Buffon's pangolin; a name derived from that by which the animal is diſtinguiſhed in Java, and conſequently preferable to Manis, or Pholidotus, or any other appellation deduced from an European language. We are told that the Malabar name of this animal is *alungu*. The natives of Bahar call it *bajar cit*, or, as they explain the word, *ſtone vermine;* and in the ſtomach of the animal before us was found about a teacupful of ſmall ſtones, which had probably been ſwallowed for the purpoſe of facilitating digeſtion; but the name alludes, we believe, to the hardneſs of the ſcales: for *vajracita* means in Sanſcrit the *diamond* or *thunderbolt reptile;* and *vajira* is a common figure in the Indian poetry for any thing exceſſively hard. The vajracita is believed by the Pundits to be the animal which gnaws their ſacred ſtone called *ſalgramaſila:* but the pangolin has apparently no teeth: and the ſalgrams, many of which look as if they had been worm-eaten, are perhaps only decayed in part by expoſure to the air.

"A female pangolin, deſcribed in the firſt volume of the Aſiatic Reſearches, had a long tongue ſhaped like that of the chameleon; and if it was nearly adult, as we may reaſonably conclude from the young found in it, the dimenſions of it were much leſs than thoſe which Buffon aſſigns generally to his pangolin; for he deſcribes its length as ſix, ſeven, or eight feet, including the tail, which is almoſt, he ſays, as long as the body, when it has attained its full growth: whereas ours is but 34 inches long from the extremity of the tail to the point of the ſnout, and the length of the tail is 14 inches; but, excluſively of the head, which is five inches long, the tail and body are indeed nearly of the ſame length; and the ſmall difference between them may ſhow, if

Buffon be correct in this point, that the animal was young. The circumference of its body in the thickeſt part is 20 inches, and that of the tail only 12. There are on each foot five claws, of which the outer and inner are ſmall when compared with the other three. There are no diſtinct toes; but each nail is moveable by a joint at its root. This creature is extremely inoffenſive. It has no teeth, and its feet are unable to graſp. Hence it would appear, that nature, having furniſhed it with a coat of mail for its protection, has, with ſome regard to juſtice, denied it the powers of acting with hoſtility againſt its fellow creatures. The nails are well adapted for digging in the ground; and the animal is ſo dexterous in eluding its enemies by concealing itſelf in holes and among rocks, that it is extremely difficult to procure one.

"The upper jaw is covered with a croſs cartilaginous ridge, which, though apparently not at all ſuited to any purpoſes of maſtication, may, by increaſing the ſurface of the palate, extend the ſenſe of taſte. The œſophagus will admit a man's forefinger with eaſe. The tongue at the bottom of the mouth is nearly about the ſize of the little finger, from whence it tapers to a point. The animal at pleaſure protrudes this member a great way from the mouth. The tongue ariſes from the enſiform cartilage and the contiguous muſcles of the belly, and paſſes in form of a round diſtinct muſcle from over the ſtomach, through the thorax, immediately under the ſternum; and interior to the windpipe in the throat. When diſſected out, the tongue could be eaſily elongated ſo as to reach more than the length of the animal excluſive of its tail. There is a cluſter of ſalivary glands ſeated around the tongue, as it enters the mouth. Theſe will neceſſarily be compreſſed by the action of the tongue; ſo as occaſionally to ſupply a plentiful flow of their ſecretion.

"The ſtomach is cartilaginous, and analogous to that of the gallinaceous tribe of birds. When diſſected, it is generally found full of ſmall ſtones and gravel, which in India are almoſt univerſally calcareous. The inner ſurface of the ſtomach is rough to the feel, and formed into folds, the interſtices of which are filled with a frothy ſecretion. The guts are filled with a ſandy pulp, in which, however, are interſperſed a few diſtinct ſmall ſtones. No veſtiges of any animal or vegetable food have been traced in the whole primæ viæ. The gall bladder is commonly diſtended with a fluid reſembling in colour and conſiſtence the dregs of beer. It is a viviparous animal.

"From the contents of its ſtomach and primæ viæ, the pangolin has been ſuppoſed by Mr Burt, a very eminent ſurgeon in Bengal, to derive its nouriſhment from mineral ſubſtances. Tho' we have perhaps no clear idea of the manner in which vegetables extract their nouriſhment from earth, yet the fact being ſo, it may not be unreaſonable to ſuppoſe, that ſome animal may derive nutriment by a proceſs ſomewhat ſimilar.

"When other ſubſtances (ſays our author) ſhall have been detected in the ſtomach of this animal, my inference, from what I have ſeen, muſt neceſſarily fall to the ground. But if, like other animals with muſcular and cartilaginous ſtomachs, this ſingular quadruped conſumes grain, it muſt be ſurpriſing that no veſtige of ſuch food was found preſent in the whole alimentary canal, ſince in that thinly inhabited country, the wild animals are free to feed without intruſion from man. Nor can it be inferred from the ſtructure of the ſtomach, that this animal lives on ants or on inſects. Animals devoured as food, though of conſiderable ſize and ſolidity, with a proportionally ſmall extent of ſurface to be acted on by the gaſtric juice and the action of the ſtomach, are readily diſſolved and digeſted by animals poſſeſſing not a cartilaginous but a membranaceous ſtomach, as, for inſtance, a frog in that of a ſnake.

"In the ſtomach many minerals are ſoluble, and the moſt active things which we can ſwallow. Calcareous ſubſtances are readily acted on. Dr Prieſtley has aſked, 'May not phlogiſtic matter be the moſt eſſential part of the food and ſupport of both vegetable and animal bodies?' I confeſs, that Dr Prieſtley's finding cauſe to propoſe the queſtion, inclines me to ſuppoſe, that the affirmative to it may be true. Earth ſeems to be the baſis of all animal matter. The growth of the bones muſt be attended with a conſtant ſupply, and in the human ſpecies there is a copious diſcharge of calcareous matter thrown out by the kidneys and ſalivary glands. May not the quadruped in queſtion derive phlogiſton from earth; ſalt, from mineral ſubſtances? And, as it is not deprived of the power of drinking water, what elſe is neceſſary to the ſubſiſtence of his corporeal machine?

"Conſidering the ſcaly covering of this animal, we may conceive, that it may be at leaſt neceſſary for its exiſtence, on that account, to imbibe a greater proportion of earth than is neceſſary to other animals. It may deſerve conſideration, that birds are covered with feathers, which, in their conſtituent principles, approach to the nature of horn and bone. Of theſe animals, the gallinaceous tribe ſwallow ſtones; and the carnivorous take in the feathers and bones of their prey: the latter article is known to be ſoluble in the membranaceous ſtomachs; and hence is a copious ſupply of the earthy principles. In truth I do not know that any thing is ſoluble in the ſtomach of animals, which may not be thence abſorbed into their circulating ſyſtem; and nothing can be ſo abſorbed without affecting the whole conſtitution. Theſe conjectures are not a little confirmed by the experiments of M. Brugnatelli of Pavia, on the authority of M. Crell, by which we learn, that ſome birds have ſo great a diſſolvent power in the gaſtric juice, as to diſſolve in their ſtomachs flints, rock cryſtal, calcareous ſtones, and ſhells." See MANIS.

PANGONIA, in natural hiſtory, the name of a genus of cryſtals, conſiſting of ſuch as are compoſed of many angles. The word is derived from πας *numerous*, and γωνια *an angle* or *bending*. The bodies of this genus are ſingle-pointed or imperfect cryſtals, compoſed of dodecangular or twelve-planed columns, terminated by twelve-planed pyramids, and the whole body therefore made up of twenty-four planes. Of this genus there are only three known ſpecies.

PANIC, denotes an ill-grounded terror or fright. Polyænus ſays, it originates from *Pan*, one of the captains of Bacchus, who with a few men put a numerous enemy to rout, by a noiſe which his ſoldiers raiſed in a rocky valley, favoured with a great number of echoes. This ſtratagem making their number appear far greater than it was, the enemy quitted a very commodious encampment, and fled. Hence all ill-grounded fears have been called *panics*, or *panic fears;* and it was this that gave occaſion to the fable of the nymph Echo's being beloved by the god Pan. Others derive the origin of it hence: that in the wars of the Titans againſt the gods, Pan was the firſt who ſtruck terror into the hearts of the giants. Theon on Aratus ſays, he did it by the means of a ſea ſhell, which ſerved him for a trumpet, whereof he was the inventor.

PANICLE, in botany, denotes a ſoft woolly beard, on which the ſeeds of ſome plants hang pendulous; as in millet, reeds, and hay.

PANICUM, in botany; a genus of the digynia order, belonging to the triandria claſs of plants. The calyx is trivalved; the third valvule being very ſmall.

The *ſpecies* are, 1. Polyſtachion; 2. Verticillatum; 3. Glaucum; 4. Viride; 5. Italicum; 6. Crus corvi; 7. Crus galli; 8. Coronum; 9. Briſoides; 10. Dimidiatum; 11. Hirtellum; 12. Conglomeratum; 13 Sanguinale; 14. Dactylon; 15. Filiforme; 16. Lineare; 17. Diſtachion; 18. Elatum; 19. Compoſitum; 20. Halvoium; 21. Dichotomum; 22. Ramoſum; 23. Coloratum; 24. Repens; 25. Miliaceum; 26. Capillare; 27. Groſſarium; 28. Latifolium; 29. Clandeſtinum; 30. Arboreſcens; 31. Curvatum; 32. Virgatum; 33. Patens; 34. Breviſolium; 35. Divaricatum.

At this place it is proper to take notice of the Guinea graſs. By ſome authors it is claſſed as a panicum; but by expert botaniſts, who have lately examined the plant, it is the *holcus polygamum.* It is a native of Africa, and brought from thence to the Weſt Indies. About 70 years ago Mr John Ellis got ſome birds from the coaſt of Guinea, and with them ſome ſeeds for their ſupport: The birds dying ſoon after, the ſeeds were thrown out of doors as uſeleſs. From theſe ſeeds a new luxuriant graſs ſprung up, which attracted the notice of Mr Ellis and his family. He had a horſe, and afterwards a cow, brought where it was; both of them eat of it greedily. It was then tranſplanted into a garden, and gradually cultivated: at this day it is common all over Jamaica; and next to the ſugar cane and plantain tree, the greateſt bleſſing to that iſland. It agrees with every ſoil and ſituation; and in many of the rocky and barren parts of Jamaica, which formerly could not ſupport a goat, may now be ſeen large herds of cattle, ſheep, and horſes, in excellent order, and fitted for all the purpoſes of rural economy or the market. Since Guinea graſs became ſo common, ſalted beef and pork is but little uſed by the white people in Jamaica. Freſh beef, mutton, pork, and poultry, are in abundance; and on the whole cheaper than ſalted meats from Ireland or America: By theſe means, too, people live better, and enjoy as good health as others in Europe.

Guinea graſs is beſt propagated by the roots, and planted about three feet aſunder. In ſix months it grows very tall, ſo as often to be ſix feet high. At this time horſes and cattle are turned in to eat what they pleaſe of it; and while they plough up the ſurface of the ground with their feet, they ſhake the ripe ſeed. The rank graſs is afterwards cut down, burned off, and the old ſtocks rooted up and thrown away. The ſeeds vegetate and throw up a plentiful crop; which with common attention will laſt many years. For this purpoſe a Guinea graſs paſture requires to be kept clean, and ſupplied in particular places as may be neceſſary from time to time. The fields ought to be divided into parks by fences, and the cattle ſhifted from one encloſure to another occaſionally.

PANINI (Paolo), a painter of perſpective and architecture. He was born at Placentia in 1691, with a moſt happy genius to painting, which he cultivated by ſtudying at Rome, where he deſigned every veſtige of ancient magnificence, the ruins of ſuperb Roman edifices, cenotaphs, columns, baths, arches, and obeliſks, as alſo ſome of the moſt entire buildings, the ornaments of modern Rome.

He ſtudied the works of Ghiſolſi with peculiar pleaſure; he formed his taſte, ſtyle, and manner, by the compoſitions of that eſteemed artiſt; and his ſtrongeſt ambition was to imitate him; ſo that he ſoon became eminent in that ſtyle beyond all his cotemporaries. His compoſition is rich; the truth of his perſpective is critically exact; and his paintings are univerſally eſteemed for the grandeur of the architecture, for the clearneſs of his colouring, for the beautiful figures which he generally introduced, and alſo for the elegant taſte with which he diſpoſed them. He always deſigned them correctly, and ſet them off with ſuitable attitudes and expreſſion.

However, this deſcription of his merit muſt be ſuppoſed to allude to his early and prime performances; for in his latter time, his pictures were diſtinguiſhable by a free and broad touch, but they are feeble in their colouring and effect. At all times, indeed, he was too apt to deſign his figures rather too large for the architecture, which diminiſhed the grandeur of the moſt magnificent parts of his compoſition, and was quite contrary to the practice of Ghiſolſi; whoſe works muſt perpetually afford a pleaſing deception to the eye, by the perſpective proportions obſerved between the figures, buildings, and diſtances.

At Rivoli, a pleaſure houſe belonging to the king of Sardinia, there are ſeveral of Panini's paintings, which are views of that fine retreat and its environs. They are beautifully coloured, well handled, and with a touch full of ſpirit; though in ſome parts the yellow ſeems a little too predominant, and the lights are not always diſtributed in ſuch a manner as to produce the moſt ſtriking effect.

PANIONIA, in antiquity, a feſtival celebrated in honour of Neptune by a concourſe of people from all the cities of Ionia. It is remarkable in this feſtival, that if the bull offered in ſacrifice happened to bellow, it was accounted an omen of divine favour; becauſe that ſound was thought to be acceptable to Neptune.

PANNARIA, one of the Lipari iſlands. See LIPARA and LIPARI.—The ancients called it *Therniſia*, from the hot waters which they found in it. It may be about eight or nine miles in circumference. It bears wheat, and grapes from which the inhabitants make wine. Pannaria, like the other adjacent iſlands, appears to be a volcano; its original having been deſtroyed by continued eruptions. It is now no longer of a conical figure. It contains about 100 inhabitants, reckoning every ſoul, men, women, and children. It is, like Stromboli, governed by a curate, who depends on the prieſt of the pariſh of St Joſeph in Lipari; and when any couple in the iſland determine to marry, they muſt croſs the ſea to Lipari to receive the nuptial benediction in the pariſh of St Joſeph, or pay a ſum for a licenſe to empower the curate of Pannaria to perform the ceremony. All the other adjoining iſlands are ſubject to the ſame regulation.

The inhabitants of Pannaria live by fiſhing, and by taking ſmall quantities of game on this and the little contiguous iſlands. They bring up and tame thoſe birds known by the name of *gulls*, which are ſeen in tempeſtuous weather flying near the ſurface of the ſea, They are here called *corracio*. The body of the bird and the tips of its wings are white; but the head, the tail, and the reſt of the wings, are gray: they are of the ſize of Indian hens; their wings are prodigiouſly large: they have their neſts on the ſteep inacceſſible cliffs of the ſeveral iſlands. When the iſlanders bring theſe birds up tame, they feed them with fiſh, which, though of ſuch ſize that you would think it impoſſible for their ſtomachs to receive them, they eagerly ſtretch their necks and ſwallow rapaciouſly. Theſe birds are thus brought up to be as tame as pullets or pigeons; and ſuch an attachment do they often acquire to the places in which they are reared, that ſome of them have been known to return to theſe iſlands after being conveyed to Mellazzo and Meſſina.

On the ſummit of a hill in this iſland, which projects over the ſea, the inhabitants pretend to ſhow a caſtle and an inſcription. But their caſtle is only an elevated peak of the rock, which nature ſeems to have prepared as a retreat for birds. It conſiſts of puzzolana; and has been actually formed by the action of winds and rains, for a long courſe of time, into a fantaſtic figure, which may appear, when careleſsly viewed from a diſtance by an undiſtinguiſhing eye, the remains of ſome ancient ſtructure. The good people of the iſland, not being able to judge of it otherwiſe than from appearance, are perſuaded, that it can be nothing but a caſtle, which muſt have been reared for the defence of the iſland aganſt the Turks and the corſairs of Barbary. Theſe they conſider as the moſt dreadful ſcourge with which mankind can poſſibly be afflicted, and fear them much more than the eruptions of the volcano. When they feel their iſland ſhaken, they embark with all their wealth, which a ſingle ſloop eaſily contains; and on board they are ſafe from both the ſhaking of the earth and the eruptions of the lava, but not from an hoſtile fleet.

In this iſland there appear various remains of ancient buildings, but very ruinous and very ſcanty. In ploughing the fields, many remains of ſepulchres, in different modes of conſtruction, are found; ſome of rough ſtones, tiles, or bricks; others conſiſting each of a ſingle ſtone. Vaſes of various ſorts and ſizes are alſo ſaid to have been found in the ſame fields, utenſils of different kinds, money, chains, and medals of lead. But none of theſe relicks of antiquity have been preſerved: the good people who found them were ignorant of their value, and therefore neglected them as trifles. In places along the ſhore of the iſland, where the ſea appears to have encroached, there are ſome hewn ſtones to be ſeen: they ſeem to be remains of walls, which muſt have been very ſtrong and of elegant architecture. In other places farther diſtant from the ſhore, there likewiſe appear fragments of walls ſunk in the ground, and apparently overwhelmed with mud, which the winds and rains have brought down from the mountain above. Theſe remains ſhow, that Pannaria, either under the Greeks, or in that period when all the elements were taxed for the gratification of Roman luxury, muſt have been adorned with ſuperb buildings, as well as the adjacent iſlands of Lipari, Stromboli, and Baſiluzzo.

PANNELS *of a* SADDLE, are two cuſhions or bolſters, filled with cows, deer, or horſes hair, and placed under the ſaddle, on each ſide, to prevent the bows and bands from galling the horſe.

PANNICULUS CARNOSUS, in comparative anatomy, a robuſt fleſhy tunic, ſituated in beaſts between the ſkin and the fat; by means of which they can move their ſkin in whole or in part. It is altogether wanting in mankind.

PANNONIA (Pliny, Strabo, Dio), an extenſive country of Europe, having the Danube on the north, Dalmatia on the ſouth, Noricum on the weſt, and Mœſia on the eaſt. It is divided into *Superior* and *Inferior* (Ptolemy, Dio). The common boundary between both were the river Arabo and Mount Cetius, having the Superior to the weſt, and the Inferior on the eaſt ſide. This diviſion is thought to be no older than the times of the Antonines. *Pannonicus* the epithet (Martial).

PANOMPHÆUS, in antiquity, a deſignation given to Jupiter, becauſe he was ſaid to be the original author of all ſorts of divination, having the books of fate, and out of them revealing either more or leſs, as he pleaſed, to inferior demons.

PANOPOLIS. See ACHMIM.

PANORMUS (Polybius, Pauſanias), a town of Achaia, in Peloponneſus, near the promontory Rhium. —Another (Ptolemy, Pliny), a town on the north ſide of Crete.—A third (Ptolemy), in Macedonia, on the Ægean ſea, near Mount Athos.—A fourth, of Samos (Livy.)—A fifth, of Sicily; an ancient city, built by the Phœnicians (Thucydides); a principal town of the Carthaginians (Polybius); ſituated between Lilybæus and Pelorus (Mela); a Roman colony. Now *Palermo*, capital of the iſland, on the north ſide. E. Long. 13. N. Lat. 38. 30.—A ſixth Panormus of the Thracian Cherſoneſus, placed by Pliny on the weſt ſide of the peninſula, and mentioned by no other writer.

PANORMUS (Ptolemy), a port of Attica; its name denoting it to be capacious.—Another, of Epirus (Strabo, Ptolemy); a large harbour in the heart of the Montes Ceraunii, below the citadel Chimæra.—A third of Ionia (Strabo); near Epheſus, with the temple of the Epheſian Diana.

PANORPA, the SCORPION FLY, in zoology, a genus of inſects belonging to the order of neuroptera. The roſtrum is horny and cylindrical; there are two pappi, and three ſtemmata; the feelers are longer than the thorax. The body of this inſect is of a black brown colour, yellow on the ſides, with a few ſpots of the ſame on the top. Its tail, formed by the three laſt ſegments of the abdomen, is of a maroon colour; of thoſe three ſegments, the laſt is larger, almoſt round, and terminates in two hooks, which conſtitutes a tail like that of the ſcorpion. The wings as long as the body, are diaphanous, reticulated, with fibres and ſtripes of ſpots of a brown colour. Sometimes we meet with different varieties of this inſect, conſiſting in the colour

Plate CCCLXXII.

Barbut on Inſects.

of the wings. Some, inſtead of ſeveral ſtripes of ſpots upon their wings, have only a ſingle black ſtripe, tranſverſe and irregular, ſituated on the middle of the wing, the extremity whereof is alſo black: others have their wings entirely white, excepting the extremity, which is black. The kind of forceps that is ſeen at the hinder part of this inſect is uſed by the males to lay hold of the females in their amorous embraces: the threatening tail of the male does no miſchief. This inſect is found in meadows, by the ſide of ditches. There are four ſpecies, diſtinguiſhed by the colour and ſhape of their wings.

PANTALARIA, an iſland in the Mediterranean ſea, between Sicily and the main land of Africa, about 17 miles in circumference. It is near the coaſt of Tunis, and abounds in cotton, fruits, and wine; but the inhabitants are obliged to bring all their corn to Sicily, as it belongs to the king of the two Sicilies. E. Long. 12. 25. N. Lat. 36. 55.

PANTÆNUS, a Stoic philoſopher, born in Sicily (though ſome have erroneouſly ſuppoſed him to be a Hebrew) about the beginning of the reign of Commodus. He preſided over the celebrated ſchool of Alexandria, where, from the time of St Mark, the founder of that church, they had always a divine that was eminent for his learning and piety, to explain the Holy Scriptures, and to inſtruct them in human learning. This employment he was obliged to leave; for when the Indians required of Demetrius biſhop of Alexandria to ſend them one to inſtruct them in Chriſtianity, he ſent Pantænus, who undertook the miſſion with joy, and behaved himſelf very properly in it. We are told, that the Indians had been tinctured with Chriſtianity by St Bartholomew the apoſtle; and that Pantænus met with the Hebrew original of St Matthew's goſpel, which the apoſtle had left there. St Jerome ſays that Pantænus brought it with him; and that it was, in his time, preſerved in the library of Alexandria. But we ſuſpect St Jerome to be miſtaken in this reſpect. When Pantænus returned to Alexandria, he reaſſumed the government of the ſchool of that city, which, it is probable, he had, during his abſence, committed to the care of St Clement, a preſbyter of Alexandria. He explained the Scriptures publicly, under the reign of Severus Antoninus Caracalla; and was, in St Jerome's opinion, more ſerviceable to the church by his diſcourſes than by his writings. He publiſhed ſome commentaries upon the Bible, which are loſt. "That the prophets often expreſs themſelves in indifferent terms, and that they make uſe of the preſent time inſtead of the paſt and future," is a rule of Pantænus, which has been followed by all ſucceeding interpreters. Theodorus has related this rule; but he ſpeaks of it as if Pantænus had rather ſaid than written it.

We may have ſome notion of Pantænus's manner of explaining the Scriptures by the like performances of St Clement of Alexandria, Origen, and others who were brought up in that ſchool.

PANTALOON, a ſort of garment conſiſting of breeches and ſtockings all of one piece; ſaid to have been firſt introduced by the Venetians.

Pantaloon, on the theatre, is a buffoon or maſked perſon, who performs high and grotesque dances, and ſhows violent and extravagant poſtures and airs. The word is likewiſe uſed for the habit or dreſs theſe buffoons uſually wear; which is made preciſely to the form of their body, and all of a piece from head to foot.

And hence thoſe who wear a habit of this kind, for conveniency, under their other clothes, are called *pantaloons* of Venice.

PANTARBE, in natural hiſtory, a name given to an imaginary ſtone, the effects of which upon gold were ſimilar to thoſe of the loadſtone upon iron. The ancients, as well as ſome modern writers, ſeem to have had an opinion that there was ſuch a ſtone; and the *amphitane* of Pliny is deſcribed as poſſeſſing this remarkable quality; but neither they nor we have ever found reaſon, from any experiment well aſcertained, to believe that there ever was ſuch a ſtone.

PANTHEA, in antiquity, were ſingle ſtatues, compoſed of the figures, or ſymbols, of ſeveral different divinities together. Father Joubert, who calls them *pantheæ*, and who has remarked them ſometimes on medals, ſays their heads are moſt commonly adorned with the ſymbols or attributes belonging to ſeveral gods. An inſtance of this appears in a medal of Antoninus Pius; which repreſents Serapis by the buſhel it bears; the Sun by the crown of rays; Jupiter Ammon by the ram's horns; Pluto by the large beard; and Æſculapius by the ſerpent twiſted in his hand. M. Baudelot, in a diſſertation on the Lares, obſerves, that the *panthea* had their origin from the ſuperſtition of thoſe, who, taking ſeveral gods for the protectors of their houſes, united them all in the ſame ſtatue, by adorning it with the ſeveral ſymbols proper to each of theſe deities.

PANTHEISM, a philoſophical ſpecies of idolatry leading to atheiſm, in which the univerſe was conſidered as the ſupreme God. Who was the inventor of this abſurd ſyſtem, is, perhaps, not known; but it was of early origin, and differently modified by different philoſophers. Some held the univerſe to be one immenſe animal, of which the incorporeal ſoul was properly their God, and the heavens and earth the body of that God; whilſt others held but one ſubſtance, partly active and partly paſſive; and therefore looked upon the viſible univerſe as the only *Numen*. The earlieſt Grecian Pantheiſt of whom we read was Orpheus, who called the world *the body of God*, and its ſeveral parts *his members*, making the whole univerſe one *divine animal*. According to Cudworth, Orpheus and his followers believed in the immaterial ſoul of the world; therein agreeing with Ariſtotle, who certainly held that God and matter are coeternal; and that there is ſome ſuch union between them as ſubſiſts between the ſouls and bodies of men. See Metaphysics, N° 264.

In the ancient Orphic theology, we are taught, that "this univerſe, and all things belonging to it, were made *within* God; that all things are contained together in the *womb* of God; that God is the *head* and *middle* of all things; that he is the *baſis* of the *earth* and *heaven*; that he is the *depth of the ſea*, the *air* we breathe, the force of the untameable *fire*; that he is the *ſun*, *moon*, and *ſtars*; that there is one divine *body*; for,

Παντα γαρ εν μεγαλω τω δε σωματι κειται

"all theſe things lie in the great body of God."—But further, to prove that the moſt ancient Greek philoſophers ſolved reſolved all things into God, and made God *all*, we ſhall cite a moſt remarkable paſſage from Plutarch's Defect of Oracles. "Whereas there are two cauſes of all generations, the divine and the human, the moſt ancient theologers and poets attended only to the more excellent of theſe two; reſolving all things into God, and pronouncing this of them univerſally;

Ζευς αρχη, Ζευς μεσσα, Διος δ' εκ παντα τετυκται.

'that God is both the beginning and middle, and that all things are out of God; inſomuch, that they had no regard at all to the other natural and neceſſary cauſes of things: but on the contrary, their juniors, who were called *naturaliſts*, deviating from this moſt excellent and divine principle, placed in all *bodies*, their paſſions, colliſions, mutations, and commixtures."

That by the moſt ancient theologers here mentioned, Plutarch meant Orpheus and his immediate followers, is plain from the Orphic verſe by which he proves their antiquity. By their juniors, whom he calls *naturaliſts*, he could mean no other than the firſt Grecian philoſophers, *Anaximander*, *Anaximenes*, and *Hippo*, who were followed by the atheiſtical atomiſts *Leucippus*, *Democritus*, *Protagoras*, and *Epicurus*. But with reſpect to the univerſe being God, and all things divine and human being modifications of mere matter, the Stoics undoubtedly agreed with Anaximander and his followers; for the ſchool of Zeno held but one ſubſtance.—See Metaphysics, N° 265. This impious doctrine, that all things are God, and that there is but one ſubſtance, was revived in modern times by Spinoza, an apoſtate Jew. As we ſhall give a life of him and a view of his principles, we muſt refer the reader for a fuller account of Pantheiſm to Spinoza. See alſo Pan.

PANTHEON, a beautiful edifice at Rome, anciently a temple, dedicated to all the gods; but now converted into a church, and dedicated to the Virgin and all the martyrs.

This edifice is generally thought to have been built by Agrippa ſon-in-law to Auguſtus, becauſe it has the following inſcription on the frieze of the portico:

M. AGRIPPA L. F. COS. TERTIUM FECIT.

Several antiquarians and artiſts, however, have ſuppoſed that the pantheon exiſted in the times of the commonwealth; and that it was only embelliſhed by Agrippa, who added the portico. Be this as it will, however, the pantheon, when perfected by Agrippa, was an exceedingly magnificent building; the form of whoſe body is round or cylindrical, and its roof or dome is ſpherical: it is 144 feet diameter within; and the height of it, from the pavement to the grand aperture on its top, through which it receives the light, is juſt as much. It is of the Corinthian order. The inner circumference is divided into ſeven grand niches, wrought in the thickneſs of the wall: ſix of which are flat at the top; but the ſeventh, oppoſite to the entrance, is arched. Before each niche are two columns of antique yellow marble fluted, and of one entire block, making in all 14, the fineſt in Rome. The whole wall of the temple, as high as the grand cornice incluſive, is caſed with divers ſorts of precious marble in compartments. The frieze is entirely of porphyry. Above the grand cornice ariſes an attic, in which are wrought, at equal diſtances, 14 oblong ſquare niches: between each niche were four marble pilaſters, and between the pilaſters marble tables of various kinds. This attic had a complete entablature; but the cornice projected leſs than that of the grand order below. Immediately from the cornice ſprings the ſpherical roof, divided by bands, which croſs each other like the meridians and parallels of an artificial terreſtrial globe. The ſpaces between the bands decreaſe in ſize as they approach the top of the roof; to which, however, they do not reach, there being a conſiderable plain ſpace between them and the great opening. That ſo bold a roof might be as light as poſſible, the architect formed the ſubſtance of the ſpaces between the bands of nothing but lime and pumice ſtones. The walls below were decorated with lead and braſs, and works of carved ſilver over them; and the roof was covered on the outſide with plates of gilded bronze. There was an aſcent from the ſpringing of the roof to the very ſummit by a flight of ſeven ſtairs. And if certain authors may be credited, theſe ſtairs were ornamented with pedeſtrian ſtatues ranged as an amphitheatre. This notion was founded on a paſſage of Pliny, who ſays, "That Diogenes the ſculptor decorated the pantheon of Agrippa with elegant ſtatues; yet that it was difficult to judge of their merit, upon account of their elevated ſituation." The portico is compoſed of 16 columns of granite, four feet in diameter, eight of which ſtand in front, with an equal intercolumniation all along, contrary to the rule of Vitruvius, who is for having the ſpace anſwering to the door of a temple, wider than the reſt. Of theſe columns is a pediment, whoſe tympanum, or flat, was ornamented with bas-reliefs in braſs; the croſs beams which formed the ceiling of the portico were covered with the ſame metal, and ſo were the doors. The aſcent up to the portico was by eight or nine ſteps.

Such was the pantheon, the richneſs of which induced Pliny to rank it among the wonders of the world.

The eruption of Veſuvius, in the reign of Tiberius, damaged the pantheon very conſiderably: it was repaired by Domitian; which occaſioned ſome writers to mention that prince as the founder of the building.—The emperor Adrian alſo did ſomething to it. But it appears, that the pantheon is more indebted to Septimius Severus, than to any one ſince its erection. The moſt, perhaps, that any of his predeceſſors had done, was the adding ſome ornament to it: Septimius beſtowed eſſential reparations upon it. The following inſcription appears upon the architrave:

IMP. CAES. SEPTIMIVS. SEVERVS.
PIVS. PERTINAX.
ARABICVS. PARTHICVS. PONTIF.
MAX. TRIB. POT.
XI. COS. III. P. P. ET. IMP. CAES.
MARCVS.
AVRELIVS. ANTONINVS. PIVS.
FELIX. AVG. TRIB.
POT. V. COS. PROCOS. PANTHEVM.
VETVSTATE.
OBRVPTVM. CVM. OMNI. CVLTV.
RESTITVERVNT.

It is really a matter of aſtoniſhment, that a ſtructure, which, granting it to have been built by Agrippa, was not more than 200 years old, ſhould have fallen into decay through age. This ſingle conſideration ſeems ſufficient to confirm the opinion of thoſe who believe it to have ſtood in the time of the commonwealth.

The temple ſubſiſted in all its grandeur till the incurſion of Alaric in the time of Honorius. Zoſimus relates, that the Romans having engaged to furniſh this barbarian prince with 3000 pounds weight of gold and 5000 pounds weight of ſilver, upon condition that he ſhould depart from their walls; and it proving impoſſible to raiſe thoſe ſums either out of the public treaſury or private purſes, they were obliged to ſtrip the temples of their ſtatues and ornaments of gold and ſilver. It is probable that the pantheon ſupplied a good part, as that of Jupiter Capitolinus was the only one in Rome that could vie with it for riches.

Alaric carried off nothing from the Romans beſides their precious metals. Thirty-nine years after this, Genſeric king of the Vandals took away part of their marbles; and whether from a greedineſs of plunder, or from a reliſh of the productions of art, loaded one of his ſhips with ſtatues. It cannot be queſtioned, but that on this occaſion the pantheon was forced to part with more of its ornaments, and that the ineſtimable works of Diogenes became the prey of this barbarian.

Before theſe unwelcome viſits of the Goths and Vandals, the Chriſtian emperors had iſſued edicts for demoliſhing the Pagan temples. But the Romans, whatever were their motives, ſpared the pantheon, which is known to have ſuffered no damage from the zeal of the pontiffs, or the indignation of the ſaints, before the firſt ſiege of Rome by Alaric. It remained ſo rich till about the year 655, as to excite the avarice of Conſtantine II. who came from Conſtantinople to pillage the pantheon, and executed his purpoſe ſo far as to ſtrip it both of its inſide and outſide brazen coverings, which he tranſported to Syracuſe, where they ſoon after fell into the hands of the Saracens.

About fifty years before this, Pope Boniface IV. had obtained the pantheon of the emperor Phocas, to make a church of it. The artiſts of theſe days were totally ignorant of the excellence of the Greek and Roman architecture, and ſpoiled every thing they laid their hands upon. To this period certain alterations are to be referred, of which we ſhall ſpeak by and by.

After the devaſtations of the barbarians, Rome was contracted within a narrow compaſs: the ſeven hills were abandoned; and the Campus Martius, being an even plain, and near the Tyber, became the groundplat of the whole city. The pantheon happening to ſtand at the entrance of the Campus Martius, was preſently ſurrounded with houſes, which ſpoiled the fine proſpect of it; and it was yet more deplorably diſgraced by ſome of them which ſtood cloſe to its walls. Pedlars ſhades were built even within its portico, and the intercolumniations were bricked up, to the irreparable damage of the matchleſs pillars, of which ſome loſt part of their capitals, ſome of their baſes, and others were chiſſeled out ſix or ſeven inches deep, and as many feet high, to let in poſts. Which excavations are to this day half filled up with brick and mortar; a ſad monument of the licentiouſneſs of the vulgar, and of the ſtupid avarice of thoſe who ſold them the privilege to ruin the nobleſt piece of art in the world!

This diſorder continued till the pontificate of Eugene IV. whoſe zeal for the decency of a conſecrated place, prevailed upon him to have all the houſes cleared away that encumbered the pantheon, and ſo the miſerable barracks in the portico were knocked down.

From the time Conſtantius carried off the braſs plating of the external roof, that part was expoſed to the injuries of the weather, or at beſt was but ſlightly tiled in, till Benedict II. covered it with lead, which Nicholas V. renewed in a better ſtyle.

It does not appear that from this time to Urban VIII. any pope did any thing remarkable to the pantheon.

Raphael Urban, who had no equal as a painter, and who as an architect had no ſuperior, left a conſiderable ſum by his will for the reparation of the pantheon, where his tomb is placed. Perino de la Vagua, Jacomo Udino, Hannibal Carracci, Flamingo Vacca, and the celebrated Archangelo Corelli, did the ſame. All the ornaments within, that have any claim to be called good, are of the later times; the paintings merit eſteem; and the ſtatues, though not maſterpieces, do honour to ſculpture, which alone is a proof that they are poſterior to the 15th century.

But, with all the reſpect due to a pontiff, who was otherwiſe a protector, and even a practiſer of the arts, it were much to be wiſhed that Urban VIII. had not known that the pantheon exiſted. The inſcriptions cut at the ſide of the door inform us, that he repaired it; yet, at the ſame time that he built up with one hand, he pulled down with the other. He cauſed two belfreys of a wretched taſte to be erected on the ancient front work, and he diveſted the portico of all the remains of its ancient grandeur, viz. the brazen coverture of the croſs beams, which amounted to ſuch a prodigious quantity, that not only the vaſt baldaquin or canopy of the confeſſional in St Peter's was caſt out of it, but likewiſe a great number of cannon for the caſtle of St Angelo. This pope, who was of the family of Barbarini, preſented alſo as much of this metal to his nephew, as was ſufficient for the decoration of his new palace; on which occaſion this remarkable paſquinade was ſtuck up:

Quod non fecerunt Barbari fecere Barbarini.

If ever gingle added force to wit, it was certainly in this inſtance.

It is ſurpriſing, that whilſt all theſe operations were carrying on in the portico, he never once thought of repairing the damages which time had wrought in it! Of the 16 pillars which ſupported this magnificent pile, there were no more than 13 left; the three next the temple of Minerva had diſappeared; with theſe the entablature and an angle of the front had tumbled down. There were not wanting in Rome fragments enough of antique columns that might have been put together, and ſet up, to have prevented the downfal of a pile which deſerved to ſtand as long as the world endured.

Alexander VII. did what Urban VIII. had neglected to do. At the ſame time that Bernini was conſtructing the colonnade of St Peter, this pontiff ordered ſearch to be made for pillars to match thoſe of the portico of the pantheon; and ſome were found not far from the French church of St Lewis of the very ſame model. They were granite of the iſle of Ilva, and thoſe of the portico were Egyptian granite; the colour however, was the ſame, ſo that the effect was equal. The pope's zeal did not ſtop here; he cauſed all the old houſes before the portico to be pulled down, and the ſoil and rubbiſh to be cleared away which covered the ſteps, and even the baſes of ſome of the pillars. He began covering the roof with marble, and raiſed a lantern over the aperture, to keep out rain; but death took him off before his project was completed. Clement IX. his ſucceſſor, encloſed the portico within iron rails. Several later popes have added to its decorations, which were all in the taſte of the times they were done in; and the body of the edifice and its architecture gained nothing from them. The main object of their holineſſes liberality was the embelliſhment of the grand altar. One gave purple curtains, another beſtowed ſilver tabernacles; others again vaſes, and ſuperb dreſſes ſuited to the ſolemn ceremonies of religion. All theſe might be called rich: but they had in no ſenſe a tendency to retrieve the ancient majeſty or original ſplendour of the temple. The true guſto of the ornaments was a little imitated at the revival of the arts. Good ſtatues took place of the ſkeletons and ſquat figures that ridiculouſly diſgraced the altars for the ſpace of eight centuries. The paintings of Perugino, Cozza, and Greſſi, covered the dull moſaics with which the Greeks of Conſtantinople had loaded the walls of moſt of the churches in Rome. The porphyry and the green and yellow antique found among the old ruins were employed to much advantage.

There was beſides at Rome another pantheon, dedicated to Minerva as the goddeſs of Medicine. It was in the form of a decagon, and the diſtance from one angle to another meaſured about 22 feet and a half. Between the angles there were nine round chapels, each of which was deſigned for a deity; and over the gate there was a ſtatue of Minerva. The pantheon of Athens was in many reſpects little inferior to the Roman one built by Agrippa. The Greek Chriſtians alſo converted it into a church, dedicated it to the Virgin, under the name of *Panegia;* and the Turks changed it into a moſque. The pantheon of Niſmes was a temple in that city, wherein were 12 niches or ſtatues, ſuppoſed to have been deſtined for the 12 great gods. In the Eſcurial is a moſt magnificent chapel called *pantheon,* 35 feet in diameter, and 38 feet high from the pavement, which is compoſed of marble and jaſper inlaid. The whole inſide of the chapel is of black marble, except the luthern, and ſome ornaments of jaſper and red marble. In this chapel are depoſited the bodies of the kings and queens; there are only places for 26, and eight of them are already filled.

PANTHER, in zoology. See Felis.

PANTING, conſiſts in a rapid ſucceſſion of inſpirations and expirations, which happens when we run or perform any violent motion.

PANTOMINE, Παντομιμος, among the ancients, a perſon who could imitate all kind of actions and characters by ſigns and geſtures, without ſpeaking.

The pantomimes made a part in the theatrical entertainments of the ancients; their chief employment was to expreſs, in geſtures and action, whatever the chorus ſung, changing their countenance and behaviour as the ſubject of the ſong varied. They were very ancient in Greece, being derived from the heroic times, according to ſome; but however this may be, they were certainly known in Plato's time. In Rome, it was ſo late as the time of Auguſtus before they made their appearance. As to their dreſs, it was various, being always ſuited as near as poſſible to that of the perſon they were to imitate. The crocota was much uſed among the Roman pantomimes, in which and other females dreſſes they perſonated women.

We have this account of them in Gibbon's hiſtory; "The pantomimes (A), who maintained their reputation from the age of Auguſtus to the ſixth century, expreſſed, without the uſe of words, the various fables of the gods and heroes of antiquity; and the perfection of their art, which ſometimes diſarmed the gravity of the philoſopher, always excited the applauſe and wonder of the people. The vaſt and magnificent theatres of Rome were filled by 3000 female dancers, and by 3000 ſingers with the maſters of the reſpective choruſſes. Such was the popular favour which they enjoyed, that in a time of ſcarcity, when all ſtrangers were baniſhed from the city, the merit of contributing to the public pleaſures exempted them from a law which was ſtrictly executed againſt the profeſſors of the liberal arts (B)."

Pantomimes are ſtill very common in England: they differ indeed in ſome reſpects from thoſe of antiquity; but they retain the name, and like theſe they conſiſt in in the repreſentations of things merely by geſtures.

PANUCO, a town and province of North America, in New Spain, lying to the north of Mexico, with a biſhop's ſee. There are veins of gold, and ſalt works, which are the principal revenue of the inhabitants.—It is ſeated near the mouth of a river of the ſame name, at a ſmall diſtance from the gulf of Mexico. W. Long. 100. 5. N. Lat. 24. 0.

PANZACCHIA (Maria Helena). This paintreſs was born at Bologna in 1668, of a noble family, and appeared to have an extraordinary genius for painting. She learned deſign under the direction of Emilio Taruffi, and in a ſhort ſpace of time made an aſtoniſhing proficiency ſo that in the compaſs of a few years ſhe acquired great readineſs in compoſition, correctneſs of outline, and a lively tint of colouring.

She alſo excelled in painting landſcapes; and by the

(A) "See the dialogue of Lucian, entitled, *De Saltatione,* Tom. II. p. 265—317. edit. Reitz. The pantomimes obtained the honourable name of χειροσοφοι; and it was required that they ſhould be converſant with almoſt every art and ſcience. Burette (in the *Memoires de l'Academie des Inſcriptions,* Tom. I. p. 127, &c.) has given a ſhort hiſtory of the art of pantomimes.

(B) "Ammianus, l. xiv. c. 6. He complains with decent indignation, that the ſtreets of Rome were filled with crowds of females who might have given children to the ſtate, but whoſe only occupation was to curl and dreſs their hair; and *jactari volubilibus gyris, dum exprimunt innumera ſimulacra, quæ finxere fabulæ theatrales.*"

the beauty of her ſituations and diſtances allured and entertained the eye of every judicious beholder. The figures which ſhe inſerted had abundance of grace; ſhe deſigned them with becoming attitudes, and gave them a lively and natural expreſſion. Her merit was inconteſtably acknowledged, and her works were exceedingly prized and coveted.

PAO-ting-fou, in China, where the viceroy reſides, is the moſt conſiderable city in the province next to Pekin. It has 20 others under its juriſdiction, three of the ſecond and 17 of the third claſs. The country around it is pleaſant, and inferior in fertility to no part of China. It is neceſſary to paſs this city in going from Pekin to the province of Chan-ſi.

PAOLO (Marco). See Paulo.

PAPA, a ſmall but ſtrong town of Lower Hungary, in the county of Veſprin. It was taken from the Turks in 1683, after raiſing the ſiege of Vienna, and is ſubject to the houſe of Auſtria. It is ſeated on a mountain, near the river Marchaez, in E. Long. 18. 10. N. Lat. 47. 20.

PAP-castle, in England, in Bridekirk pariſh, Cumberland, ſtood two miles from Cockermouth, on the other ſide of the Darwent, whoſe Roman antiquity is proved by ſeveral monuments; and a large green ſtone veſſel found here, with little images upon it, is ſuppoſed to have been formerly a Daniſh font for dipping of infants; and has been ſince uſed at Bridekirk in the neighbourhood for their ſprinkling.

The name of *Pap-caſtle* ſeems to be contracted from Pipard its owner: it is ſaid to have been demoliſhed, and the materials employed to build Cockermouth caſtle.

Mr Routh, in a letter to Mr Gale, thus deſcribes the ruins diſcovered at Pap-caſtle, Jan. 16. 1741-2.

Camden's Britannia, Gough's edit.

"I made particular inquiry of the man in whoſe grounds they were diſcovered, and of ſome of the neighbours preſent at the diſcovery. The cloſe in which they lay is a little to the ſouth of the fort, on the declivity of the hill to the river, and bounded on the weſt by a narrow lane, probably the *via militaris* continued; and is uſually ſhown to ſtrangers as the moſt remarkable here for finding Roman coins. They are the largeſt ruins ever known to be diſcovered in theſe parts: for they met with three walls beſides the pavement; the firſt lay eaſt and weſt, and was covered with earth near a foot high; parallel to it at ſeven yards, they found a ſecond; and between theſe two, about two yards deep (the height of the walls, which were ſix yards broad, and ſtrongly cemented), they came to a pavement curiouſly laid with large flags, three quarters of a yard ſquare, and two or three inches thick, as I meaſured them: but imagining there muſt be money under it, they covered it up till night, and then tore it all up. It was compoſed of flags of different thickneſs: under the thinner was a coarſe ſtrong cement, which cauſed them to be broken in taking up; but the thicker are pretty entire. Part of the wall ſtood on the floor, and the edge was ſecured by a fine red cement two inches thick, ſuppoſed to be intended to keep the floor dry. They imagined themſelves at the corner of the building, the third wall ſtanding at right angles with the firſt, and the ſecond parallel to the ſtony lane, on which was an old hedge. On the floor they found a ſtone trough, or rather baſe of a pillar, about a foot high, and the hollowed part ſquare, and two inches deep. They likewiſe found a ſmall earthen patera, which I procured, of the fine red clay, beautifully ſmooth, with letters impreſſed on the bottom; but ſo defaced as not to be intelligible.—Some years ago, the man's father who found theſe ruins dug up a conduit. The owner had no coins, nor knew of any. One of his neighbours ſhowed me a large braſs one defaced."

Mr Routh, in another letter to Mr Gale, April 13. 1743, deſcribes a fibula, a coin of Trajan, ... IANO AVG.... P. M. Rev. the emperor ſeated on a pile of arms, a trophy before him, S. P. Q. R. OPTI.. .. S. C. and two oaken pieces of the adjoining timber of a houſe which appeared to have been burnt, in the gardens of Jerom Tully, Eſq; of Carliſle. The earth as far as they dug was artificial, and antiquities are only found at a conſiderable depth.

Dr Stukeley ſays, the Roman caſtrum lies on the top of the hill above the village, and he traced its whole circumference, a bit of the Roman wall by the river ſide going to Wigton, and there the ditch is plainly viſible, though half filled up with the rubbiſh of the wall. A ſubterraneous vault, floored with large ſlabs of free ſtone, was found in the paſture of the ſouth-eaſt angle. The name of *Boroughs* includes both cloſes where it ſtood; and they find ſtones and ſlates with iron pins in them, coins, &c. on the whole ſpot below it, towards the water ſide. It was a beautiful and well choſen plan, on the ſouth-weſt ſide of a hill, a noble river running under, and pretty good country about it. Coins of Claudius, Adrian, and a ſilver Geta, PONT. *rev.* PRINCEPS IVVENTVTIS. He ſuppoſes its ancient name *Derventio*, derived from the Darwent.

PAPAVER, the Poppy: A genus of the monogynia order, belonging to the polyandria claſs of plants; and in the natural method ranking under the 27th order, *Rhoeadæ*. The corolla is tetrapetalous; the calyx diphyllous; the capſule bilocular, opening at the pores below a perſiſting ſtigma.

Species. 1. The ſomniferum, or ſomniferous common garden-poppy, riſes with an upright ſmooth ſtalk, dividing or branching a yard or more high; garniſhed with large, deeply jagged, amplexicaule, ſmooth leaves; and terminated by large, ſpreading, dark purple, and other coloured flowers, in the varieties, having ſmooth cups and capſules. There are a great many varieties, ſome of them extremely beautiful. The white officinal poppy is one of the varieties of this ſort. It grows often to the height of five or ſix feet, having large flowers, both ſingles and doubles, ſucceeded by capſules or heads as large as oranges, each containing about 8000 ſeeds.

Plate CCCLXXIII.

We are told, that in the province of Bahar in the Eaſt Indies, the poppy ſeeds are ſown in the months of October and November, at about eight inches diſtance, and well watered, till the plants are about half a foot high, when a compoſt of dung, nitrous earth, and aſhes, is ſpread over the areas; and a little before the flowers appear, they are again watered profuſely till the capſules are half grown, at which time the opium is collected; for when fully ripe, they yield but little juice: two longitudinal inciſions from below upwards, without penetrating the cavity, are made at ſunſet for three or four ſucceſſive evenings; in the morning the juice is ſcraped off with an iron ſcoop, and

Leigh on Opium.

Papaver.

and worked in an iron pot in the ſun's heat till it is of a conſiſtence to be formed into thick cakes of about four pounds weight; theſe are covered over with the leaves of poppy, tobacco, or ſome other vegetable, to prevent their ſticking together, and in this ſituation they are dried.

The ſomniferous quality of the white poppy is well known. This quality reſides in the milky juice of the capſule containing the ſeeds, nor is it evaporated by drying the juice; hence the dried capſules are preſerved in the ſhops for making the ſyrup. The inſpiſſated juice itſelf is a kind of opium; and for an account of its virtues ſee the article Opium. The ſeeds alſo make a very agreeable emulſion, but have no ſoporific virtue.

Woodville's Medical Botany.

It grows in England, generally in neglected gardens, or uncultivated rich grounds, and flowers in July and Auguſt. This ſpecies is ſaid to have been named *white poppy* from the whiteneſs of its ſeeds; a variety of it, however, is well known to produce black ſeeds; the double-flowered white poppy is alſo another variety: but for medicinal purpoſes, any of theſe may be employed indiſcriminately, as we are not able to diſcover the leaſt difference in their ſenſible qualities or effects. The ſeeds, according to ſome authors, poſſeſs a narcotic power; but there is no foundation for this opinion: they conſiſt of a ſimple farinaceous matter, united with a bland oil, and in many countries are eaten as food. As a medicine, they have been uſually given in the form of emulſion, in catarrhs, ſtranguries, &c. The heads or capſules of the poppy, which are directed for uſe in the pharmacopœias, like the ſtalks and leaves, have an unpleaſant ſmell, ſomewhat like that of opium, and an acrid bitteriſh taſte. Both the ſmell and taſte reſide in a milky juice, which more eſpecially abounds in the cortical part of the capſules, and in its concrete ſtate conſtitutes the officinal opium. Theſe capſules are powerfully narcotic or anodyne; boiled in water, they impart to the menſtruum their narcotic juice, together with the other juices which they have in common with vegetable matters in general. The liquor, ſtrongly preſſed out, ſuffered to ſettle, clarified with whites of eggs, and evaporated to a due conſiſtence, yields an extract which is about one-fifth or one-ſixth of the weight of the heads. This poſſeſſes the virtues of opium, but requires to be given in double its doſe to anſwer the ſame intention, which it is ſaid to perform without occaſioning a nauſea and giddineſs, the uſual effects of opium. This extract was firſt recommended by Mr Arnot and a ſimilar one is now received in the Edinburgh Pharmacopœia. It is found very convenient to prepare the ſyrup from this extract, by diſſolving one drachm in two pounds and a half of ſimple ſyrup. The *ſyrupus papaveris albi*, as directed by both colleges, is a uſeful anodyne, and often ſucceeds in procuring ſleep, where opium fails; it is more eſpecially adapted to children. White poppy heads are alſo uſed externally in fomentations, either alone, or more frequently added to the decoction *pro fomento*.

Papaver Papaw.

2. The rhœas, or wild globular headed poppy, riſes with an upright, hairy, multiflorous ſtalk, branching a foot and a half high; garniſhed with long, pinnatifid, deeply cut, hairy leaves; the ſtalk terminated by many red and other coloured flowers in the varieties, ſucceeded by globular ſmooth capſules.

Plate CCCLXXIII.

This plant is common in corn fields, and flowers in June and July. It may be diſtinguiſhed from *p. dubium*, to which it bears a general reſemblance, by its urn-ſhaped capſules, and by the hairs upon the peduncles ſtanding in a horizontal direction. The capſules of this ſpecies, like thoſe of ſomniferum, contain a milky juice, of a narcotic quality, but the quantity is very inconſiderable, and has not been applied to any medical purpoſe; but an extract prepared from them has been ſucceſsfully employed as a ſedative. The flowers have ſomewhat of the ſmell of opium, and a mucilaginous taſte, accompanied with a ſlight degree of bitterneſs. A ſyrup of theſe flowers is directed in the London Pharmacopœia, which has been thought uſeful as an anodyne and pectoral, and is therefore preſcribed in coughs and catarrhal affections; but it ſeems valued rather for the beauty of its colour than for its virtues as a medicine.

Woodville.

3. The Cambricum, or Welſh poppy, has a perennial root, pinnated cut leaves, ſmooth, upright, multiflorous ſtalks, a foot and a half high: garniſhed with ſmall pinnated leaves, and terminated by many large yellow flowers, ſucceeded by ſmooth capſules.—The flowers appear in June.

4. The orientalis, or oriental poppy, hath a large, thick, perennial root; long, pinnated, ſawed leaves; upright, rough, uniflorous ſtalks, terminated by one deep red flower, ſucceeded by oval, ſmooth, capſules. The flowers appearing in May.

Propagation. All the kinds are hardy, and will proſper anywhere. The two firſt ſpecies being annual, are to be propagated only by ſeeds; but the two laſt by parting the roots as well as the ſeeds.

PAPAW, or Papa tree. See Carica.

PAPER.

PAPER is a word evidently derived from the Greek παπυρος *papyrus*, the name of that celebrated Egyptian plant which was ſo much uſed by the ancients in all kinds of writing. It would be unneceſſary partilarly to deſcribe the different expedients which men in every age and country have employed for giving ſtability to their ideas, and for handing them down to their children. When the art of writing was once diſcovered, ſtones, bricks, leaves of trees, the exterior and interior bark, plates of lead, wood, wax, and ivory, were employed. In the progreſs of ſociety, men have invented the Egyptian paper, paper of cotton, paper manufactured from the bark of trees, and in our times from old rags.

The inhabitants of Ceylon, before the Dutch made themſelves maſters of the iſland, wrote on the leaves of the talipot. The manuſcript of the bramins, ſent to Oxford from Fort St George, is written on the leaves of a palm of Malabar. Herman ſpeaks of another palm in the mountains of that country which produces leaves of ſeveral feet in breadth. Ray, in his Hiſtory of Plants, Vol. II. Book xxxii. mentions ſome trees both in India and America, the leaves of which are proper for writing. From the interior ſubſtance of theſe leaves they draw a whitiſh membrane, large, and ſomewhat like the pellicle of an egg; but the paper made by art, even of the coarſeſt materials, is much more convenient in uſe than any of theſe leaves.

The Siameſe, for example, make two kinds of paper, the one black and the other white, from the bark of a tree which they call *Pliokkloi*. Theſe are fabricated in the coarſeſt manner; but they can be uſed on both ſides with a bodkin of fullers earth.

The nations beyond the Ganges make their paper of the bark of many trees. The other Aſiatic nations within the Ganges, excepting thoſe toward the ſouth, make it of old rags of cotton cloth; but from their ignorance of the proper method, and the neceſſary machinery, their paper is coarſe. This, however, is by no means the caſe with that made in China and Japan, which deſerves attention from the beauty, the regularity, the ſtrength, and fineneſs of its texture. In Europe they have diſcovered, or rather carried to perfection, the ingenious art of making paper with old rags, originally either from flax or hemp; and ſince this diſcovery the paper produced from our manufactures is ſufficient for every purpoſe. And though theſe materials have been hitherto abundant, ſeveral philoſophers have attempted to ſubſtitute other vegetable ſubſtances in their place. In the 6th volume of the Tranſactions of the Society for the Encouragement of Arts, we have an account of paper made by Mr Greeves near Warrington from the bark of willow twigs; and it has been obſerved by a ſociety of able critics, that hop buds would probably anſwer this purpoſe better. The rags in common uſe for paper-making are a texture of ſupple and ſtrong fibres ſeparated by a ley from the bark of the plants. It would be in vain to employ the whole body of the plant, as this ſubſtance forms a very improper ſtuff for the operations of the paper mill. From theſe principles we are directed in the choice of vegetable ſubſtances fit for the preſent purpoſe. The greater or leſs degree of purity in the materials is not abſolutely neceſſary; for flax itſelf, without any preparation, could be made into paper; but it would be extremely coarſe, and the bark of nettles or mallows would not bear the expence of labour. Although cotton be uſed in the fabrication of paper in the Levant, and perhaps in China, we are not to conclude that the down of plants in Europe, without the ſtrength or ſuppleneſs of cotton, will anſwer the ſame purpoſe.

History.

The chief kinds of paper which merit attention in this work are, 1. The Egyptian paper; 2. The paper made from cotton; 3. Paper from the interior bark of trees or liber; 4. Chineſe paper; 5. Japaneſe paper; 6. Paper made from aſbeſtos; and, 7. Paper made from linen rags.

1 Egyptian paper.

This is the famous paper uſed by the ancients, which was made of a kind of reed called *papyrus*, growing in Egypt on the banks of the Nile. According to Iſidorus, this paper was firſt uſed at Memphis, and Lucan ſeems to be of the ſame opinion,

> *Nondum flumineas Memphis connexere biblos*
> *Noverat.* PHARSAL. Lib. III. ver. 222.

Whatever truth may be in this, it is certain, that of all the kinds of paper uſed by the ancients, the papyrus was the moſt convenient, both from its flexibility and from the eaſe of fabrication. It was a preſent from nature, and required neither care nor culture.

It is not certain at what particular period the ancients began to make paper of papyrus; but there are ſeveral authorities which prove the uſe of it in Egypt long before the time of Alexander the Great.

Pliny, lib. xiii. cap. 11. gives a full deſcription of the method of making this paper in Egypt. They divide, ſays he, with a kind of needle the ſtem of the papyrus into thin plates or ſlender pellicles, each of them as large as the plant will admit. Theſe are the elements of which the ſheets of paper are compoſed. The pellicles in the centre are the beſt; and they diminiſh in value as they depart from it. As they were ſeparated from the reed, they were extended on a table, and laid acroſs each other at right angles. In this ſtate they were moiſtened by the water of the Nile, and while wet were put under a preſs, and afterwards expoſed to the rays of the ſun. "It was ſuppoſed that the water of the Nile ‡ had a gummy quality neceſſary to glue theſe ſtripes together. This, ſays Mr Bruce, we may be aſſured is without foundation, no ſuch quality being found in the water of the Nile; on the contrary, I found it of all others the moſt improper, till it had ſettled and was abſolutely diveſted of all the earth gathered in its turbid ſtate. I made ſeveral pieces of this paper both in Abyſſinia and Egypt; and it appears to me, that the ſugar or ſweetneſs with which the whole juice of this plant is impregnated, is the matter that cauſes the adheſion of theſe ſtripes together; and that the uſe of the water is no more than to diſſolve this, and put it perfectly and equally in fuſion." When there was not enough of ſugar in the plant, or when the water did not ſufficiently diſſolve it, the pellicles were united by a paſte made of the fineſt wheat flour, mixed with hot water and a little vinegar, and when dried they were flattened and ſmoothed by the beating of a mallet.

‡ *Pliny*, Lib. XIII. c. 12.

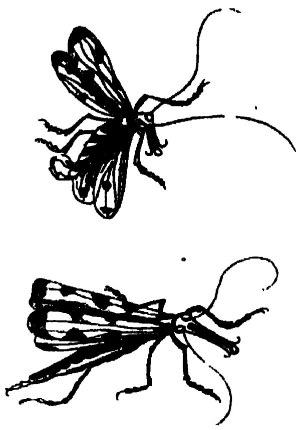
The ſize of this paper varied much; it ſeldom exceeded two feet, but it was oftentimes ſmaller. It had different names according to its ſize and quality: The firſt was called *Imperial*, which was of the fineſt and largeſt kind, and was uſed for writing letters by the great men amongſt the Romans. The ſecond ſort was called by the Romans the *Livian* paper, from Livia the wife of Auguſtus; each leaf of this kind was 12 inches. The third ſort was called the *Sacerdotal* paper, and was 11 inches in ſize.

The paper uſed in the amphitheatres was of the dimenſions of nine inches. But what was eſteemed of greateſt value in it, was its ſtrength, whiteneſs, and poliſh. The ink, however, ſunk leſs in paper highly poliſhed; and therefore the characters were more liable to be effaced. When it was not carefully ſoaked in the firſt preparation, the paper brought a leſs price;

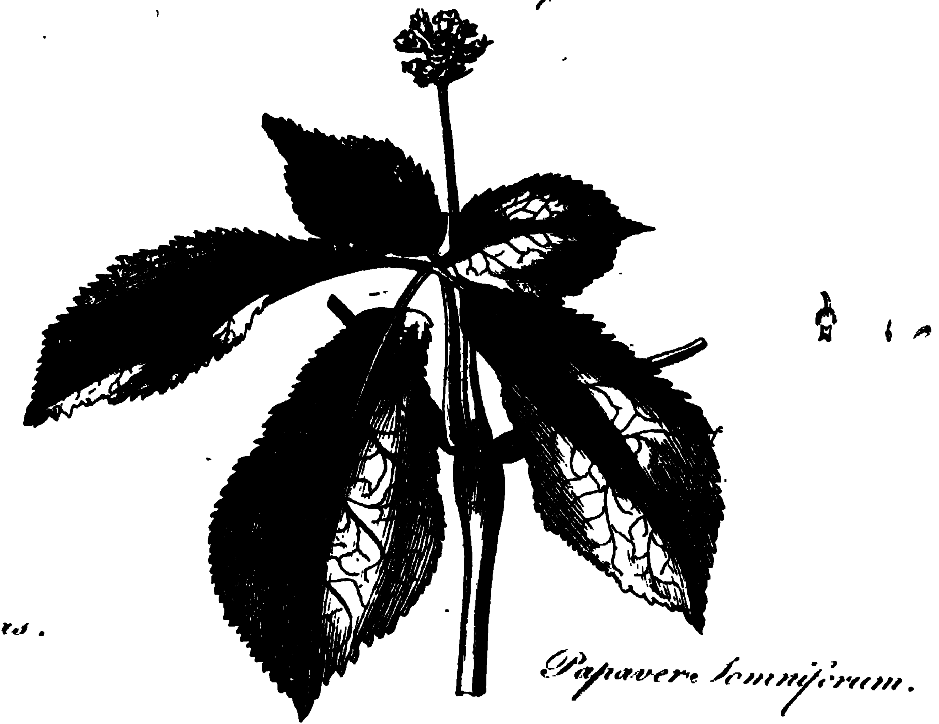
becauſe

Plate CCCLXXIII.

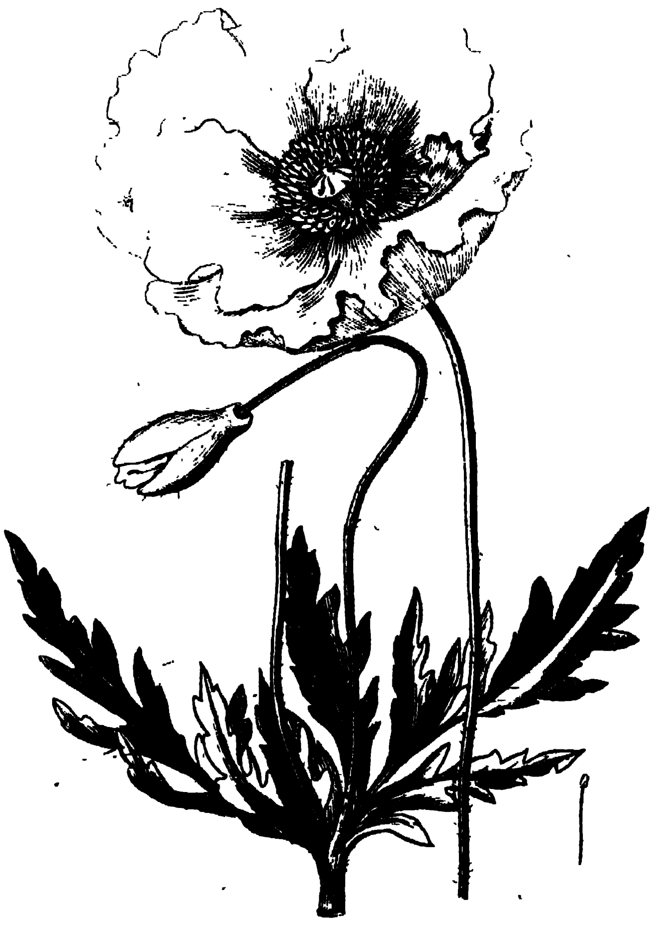
Panorpa.



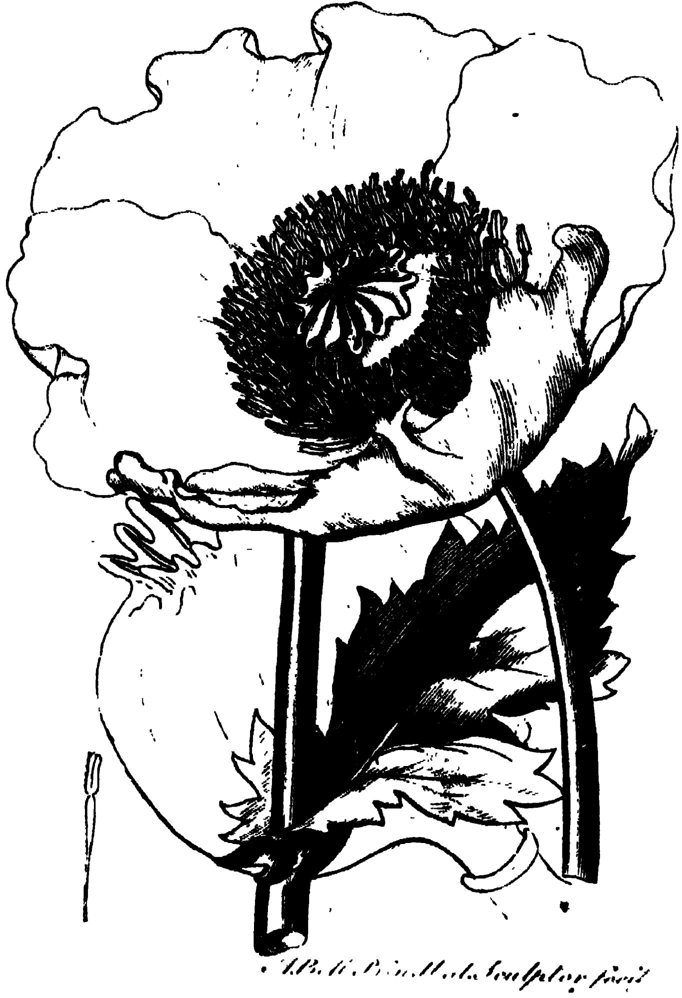
Panax Quinquefolium.



Papaver Rhoeas.



Papaver Somniferum.



A. Bell Prin. Wal. Sculptor fecit.

becauſe letters were with difficulty formed upon it, and it ſent forth a diſagreeable ſmell. To remedy this defect, the paper went though a new courſe of ſizing and hammering; and the ſize uſed on that occaſion was made of light bread ſteeped in boiling water, and paſſed through a filtering cloth. By this means the paper became in the higheſt degree united, and ſmoother than the fineſt linen. It was this paper which gave ſo long a duration to the works of the Gracchi, Tiberius, and Caius, in their own handwriting. "I have ſeen them (ſays Pliny) in the library of Pomponius Secundus, a poet and citizen of the firſt rank, near 200 years after they were written." We may add, that manuſcripts of this paper ſtill remain, which have undoubtedly been written 1000 or 1200 years ago. It appears from Pliny, that the Egyptians paſted together the pellicles of the papyrus by means of the water of the Nile; but that the poliſhing with ivory, and the operations of the hammer and the preſs, were added by the invention and induſtry of the Roman artiſts. The Egyptians ſeem to have known the uſe of ſize; but it is evident from the ſame author, that the Romans uſed a ſtronger ſize in the making of paper. Notwithſtanding the care which was taken to give ſtrength and conſiſtency to the paper of Egypt, the leaves, although collected into a book, were too weak to ſupport themſelves; and for this reaſon it was a common practice, after every five leaves, to inſert a leaf of parchment. There ſtill remains in the abbey de St Germain de-pres a fragment of the epiſtles of St Auguſtine written in this manner. The manuſcript is at leaſt 1100 years old, and in a high ſtate of preſervation.

This paper was an important branch of commerce to the Egyptians, which continued to increaſe towards the end of the Roman republic, and became ſtill more extenſive in the reign of Auguſtus. The demand from foreign nations was often ſo great, as to occaſion a ſcarcity at Rome; and we read in the reign of Tiberius of a tumult among the people in conſequence of this ſcarcity. In a letter of the emperor Adrian, the preparing of the papyrus is mentioned as one of the principal occupations at Alexandria. "In this rich and opulent city (ſays he) nobody is ſeen idle: Some are employed in the manufactory of cloth, ſome in that of writing paper," &c. During the time of the Antonines, this commerce continued equally to flouriſh. Apuleius ſays, that he wrote on the paper of Egypt with a reed of the Nile prepared at Memphis.

The demand for this paper was ſo great towards the end of the third century, that when the tyrant Firmus conquered Egypt, he boaſted that he had ſeized as much paper and ſize as would ſupport his whole army.

St Jerome informs us, that it was as much in uſe in the fifth century when he flouriſhed. The duty on the importation of this commodity had grown exceſſive towards the end of this or the beginning of the ſixth century; and being aboliſhed by Theodoric king of Italy, Caſſiodorus, in the 38th letter of his 11th book, congratulates the whole world on the diſcharge of an impoſt on a merchandiſe ſo eſſentially neceſſary to mankind.

The fathers Montfaucon and Mabillon mention ſeveral fragments written on this paper in the ſixth century. One of them was a charter of the emperor Juſtinian, entitled, *Charta plenariæ ſecuritatis.* Father Montfaucon ſaw in 1698, in the library of Julio Juſtiniani, three or four fragments of paper of Egypt of the ſame antiquity. And Mabillon ſpeaks of ſome books of the Jewiſh antiquities by Joſephus tranſlated into Latin, which ſeemed to have been written in the ſame century, and which were preſerved in the library of St Ambroſe of Milan, but he had not ſeen the manuſcripts. The ſame father mentions to have ſeen in the library of St Martin of Tours the remains of an old Greek manuſcript of the paper of Egypt, and which appeared to him to be of the ſeventh century. He alſo believes, that the copy of St Mark's goſpel preſerved in the regiſter office of Venice is written on the ſame paper, that it is the moſt ancient of any of the evangelical manuſcripts, and may be ſuppoſed to be written at the lateſt in the fourth century.

According to the ſame antiquarian, the paper of Egypt was uſed in France, in Italy, and other European countries, both for books of learning and public records; and there ſtill remains, adds he, a great number of theſe in the archives of the church at St Dennis, at Corbie, in the abbey de Graſſe, and in other convents.

It is probable, that the invention of paper made of cotton, of which we are afterwards to treat, inſenſibly deſtroyed the reputation and manufacture of the paper of Egypt; but it is ſtill a queſtion at what particular period the fabrication of the latter totally ceaſed. Euſtachius, the learned commentator on Homer, aſſures us, that in his time in 1170 it was no longer in uſe; but Father Mabillon maintains, that many of the popiſh bulls were written on the papyrus in the 11th century.

The Count Maffei, in his *Iſtor Diplomat.* Lib. II. *Biblioth. Ital.* Tom. II. p. 251. is decidedly of opinion, that the paper of Egypt was not in uſe in the fifth century. He conſiders all records written on this paper dated poſterior to this period as not authentic; and the popiſh bulls mentioned by Father Mabillon appear to this learned perſon, as well as the copy of St Mark's goſpel, to be written on paper manufactured from cotton. To reconcile in ſome meaſure theſe contradictory accounts, it may be obſerved, that on ſome particular occaſions, and by ſome particular perſons, the paper of Egypt might have been employed for ſeveral hundred years after it ceaſed to be of general uſe. Whoever wiſhes for a fuller account of the paper of Egypt, may conſult among the ancients Pliny, lib. xiii. and Theophraſtus, lib. iv. chap. ix. and among the moderns, Guillandinus, Scaliger, Saumaiſe, Kerchmayer, Ngriſoli; Father Hardouin in his edition of Pliny; Father Mabillon in his work *De re Diplomat.*; Montfaucon in his Paleography, and in his Collections; the illuſtrious Maffei in his *Iſtor. Diplomat.* the Count de Caylus in the Memoirs of the Academy of Inſcriptions, and Mr Bruce in his Travels to diſcover the Source of the Nile.

2
Paper made from cotton.

It is generally ſuppoſed that the invention of the paper, called *charta bombycina*, ſupplanted the Egyptian paper in Greece. This paper is incomparably more laſting, and better calculated for all the purpoſes of writing. It is not preciſely known at what period this art, which ſuppoſes a great variety of previous experiments, was firſt reduced to practice. The application of cotton to the purpoſes of paper-making requires as much labour and ingenuity as the uſe of linen rags; and for this reaſon, if we could determine the preciſe time when paper was made from cotton, we ſhould alſo fix the invention of the art of paper-making as it is preſently practiſed in Europe. Father Montfaucon proves, by inconteſtable authorities, that paper from cotton was uſed in 1100. This paper in the Greek language is called χαρτης βομβυκινος, or βαμβακινος; for although βομβυξ is the Greek word for ſilk, yet in thoſe times it was applied, as well as βαμβαξ, to cotton: and hence the Italians to this day call cotton *bambaccio*.

The moſt ancient manuſcript of this paper which Father Montfaucon ſaw with the date, was that in the French king's library, written A. D. 1050; but as the manuſcripts without date are infinitely more numerous than thoſe which are dated, and as ſome conjecture can be formed concerning them from the manner of writing, this father believes ſome of theſe to have been written in the tenth century.

The reſearches of the ſame learned antiquarian amount almoſt to a proof that this paper was diſcovered towards the end of the ninth century or beginning of the tenth; for before the twelfth century it was commonly uſed in the eaſtern empire, and even in Sicily. Roger king of Sicily ſays, in a diploma written in 1145, that he had renewed on parchment a charter which had been written on paper of cotton, in the year 1100, and another which was dated in the year 1112. About the ſame time the empreſs Irene, in the ſtatutes for ſome religious houſes at Conſtantinople, ſays that ſhe had left three copies of the ſame ſtatutes, two in parchment and one in paper from cotton. From that period this paper was ſtill more in uſe through all the eaſtern empire; and innumerable Greek manuſcripts are found written on it in all the great libraries.

This diſcovery happened at a time when there ſeems to have been a great ſcarcity of parchment; for it was about this period that the Greeks eraſed the writings of Polybius, Diodorus of Sicily, and many valuable ancient authors, for the ſake of the parchment.

It was the invention of this paper of cotton which deſtroyed the manufactures of the paper of Egypt; for, if we may believe Euſtathius, who wrote towards the end of the twelfth century, the latter paper had gone into diſuſe but a little before his time. We may eaſily believe, however, that this new invention, although of great advantage to mankind, was introduced by degrees.

The manufacture of this kind of paper has flouriſhed in the Levant for many ages, and is carried on with great ſucceſs even to this day. It is not neceſſary to ſay any thing farther, than that the paper produced from cotton is extremely white, very ſtrong, and of a fine grain.

3
Paper from the interior bark of trees or liber.

This paper of the ancients was made from the white pellicle or inner coat found in many trees between the bark and the wood. The trees commonly in uſe were the maple, the plane tree, the elm, the beech, the mulberry, and moſt frequently the linden tree. The ancients wrote on this inner coat after they had ſeparated it from the bark, beat, and dried it.

The fathers Mabillon and Montfaucon ſpeak frequently of manuſcripts and diplomas written on paper made from bark; and poſitively diſtinguiſh it from the Egyptian paper, becauſe it was thicker, and compoſed of parts leſs adhering together.

There are many palm trees in India and America to which botaniſts have given the name *papyraceous*, becauſe the natives have written with bodkins either on the leaves or the bark. Such is the American palm, called *tal* by the Indians; and of the ſame kind is the guajaraba of New Spain. Every palm, the bark of which is ſmooth, and the leaves large and thick, may be uſed for this purpoſe.

4
Chineſe paper.

The art of making paper from vegetables reduced to ſtuff was known in China long before it was practiſed in Europe; and the Chineſe have carried it to a degree of perfection hitherto unknown to the European artiſts. The fine paper in China is ſofter and ſmoother than that of Europe; and theſe qualities are admirably adapted to the pencil, which the Chineſe uſe in writing. Several kinds of their paper diſcover the greateſt art and ingenuity, and might be applied with much advantage to many purpoſes. They are capable of receiving, for example, the impreſſion of types; and both maps and prints have been executed with ſucceſs on the Chineſe paper.

The different ſorts of paper vary in China according to the materials of which they are compoſed, and to the different manner of manufacturing thoſe materials. Every province has its peculiar paper. That of Se-chwen is made of linen rags as in Europe; that of Fo-kien, of young bamboo; that of the northern provinces, of the interior bark of the mulberry; that of the province of Kiang-nan, of the ſkin which is found in the webs of the ſilk worm; finally, in the province of Hu-quang, the tree chu or ko-chu furniſhes the materials with which they make paper.

The method of fabricating paper with the bark of different trees is nearly the ſame with that which is followed in the bamboo. To give an idea, therefore, of the manner of manufacturing the interior barks of the mulberry, the elm, and the cotton tree, it will be ſufficient to confine our obſervations to the bamboo.

The bamboo is a kind of cane or hollow reed, divided by knots; but larger, more elaſtic, and durable than any other reed.

The whole ſubſtance of the bamboo compoſed of filaments, and a great abundance of fibrous materials, is employed in this operation. The ſhoots of one or two years, nearly the thickneſs of a man's leg, are preferred. They ſtrip the leaves from the ſtem, cut them into pieces of four or five feet long, make them into parcels, and put them into water to macerate. As ſoon as they are ſoftened, which generally happens in five days; they waſh them in pure water; put them into a dry ditch; cover them with lime for ſome days, which they water for the purpoſe of ſlacking: they waſh them carefully a ſecond time; cut every one of the pieces into filaments, which they expoſe to the rays of the ſun to dry and to bleach them. After this they are boiled in large kettles, and then reduced to ſtuff in mortars of wood, by means of a hammer with a long handle, which the workman moves with his foot.

The ſtuff being thus prepared, they take ſome ſhoots of a plant named *koteng*, which, ſteeped in water four or five days, is reduced to an unctuous or glutinous ſubſtance; and when they proceed to make the paper, this is mixed with the ſtuff in certain exact quantities, for on this mixture depends the goodneſs of the paper.

When the extract from the koteng is mixed with ſtuff of the bamboo, the whole mixture is beat together in mortars till it becomes a thick and viſcous liquor. This is poured into large tubs or reſervoirs, ſo exactly framed as that no part of the liquor can eſcape.

The workmen after this plunge their forms into the liquor; take out what is ſufficient for a ſheet of paper; which immediately, from the glutinous ſubſtance, becomes firm and ſhining; and is detached from the form by turning down the ſheet on the heap of paper already made, without the interpoſition of pieces of woollen cloth, as in Europe.

In order to dry this paper, they have a hollow wall, the two fronts of which are ſmooth and extremely white. At the extremity of this wall is placed a ſtove, the pipes of which are carried in a circular manner through the whole empty ſpace. The ſheets of paper are laid on the ſurface, to which they adhere till they come over them with a ſoft bruſh; and after they are dry, it is eaſy to diſtinguiſh the ſide which received impreſſions from the bruſh from that which adhered to the wall. By means of this ſtove the Chineſe dry their paper as faſt as they can make it; but it is only in cold ſeaſons, or in certain provinces, that they find this expedient neceſſary.

The Chineſe paper muſt be dipped in a ſolution of alum before it can take either ink or colours. They call this operation *faner*, from the Chineſe word *fan*, which ſignifies alum. The following is the manner of preparing this ſolution: Six ounces of iſinglaſs cut very ſmall is put into boiling water, and conſtantly ſtirred, that it may diſſolve equally. When the iſinglaſs is wholly diſſolved in the water, they throw in twelve ounces of calcined alum, which is alſo ſtirred till it is completely diſſolved and mixed with the iſinglaſs. This compoſition is afterwards poured into a large and deep baſon, at the mouth of which is a little round piece of wood; the extremity of every ſheet of paper is fixed in another piece of wood, with a ſlit made to receive it; by means of this equipage they plunge the ſheet of paper into the compoſition of alum and iſinglaſs; and when it is fully penetrated, they draw it out, making it glide over the little round piece of wood. The long piece of wood which holds the ſheet by one end, and keeps it from tearing, is afterwards ſuſpended with it on a wall till it is ſufficiently dry.

The Chineſe give the paper intended for different purpoſes different preparations. We ſhall confine our obſervations to the ſilver colour which they give to ſome paper. They take two ſcruples of paſte made of cow's hide, one ſcruple of alum, and a pint of water: the whole is boiled on a ſlow fire till the water be evaporated. The ſheets of paper are then ſtretched on a ſmooth table, and covered over with two or three layers of this paſte. They take afterwards a certain quantity of talc, waſhed and boiled in water, with the proportion of one third of alum; this is dried, reduced to a powder, paſſed through a ſieve, boiled a ſecond time in water, dried in the ſun, and again paſſed through the ſieve. This powder is ſpread equally over the ſheets of paper, prepared as we mentioned above; and then they are dried ſlowly in the ſhade.

The ſheets of paper, covered in this manner with talc, are laid upon a table, and rubbed with a little cotton; which fixes a certain quantity of the talc in the paper, and carries off the overplus to be uſed on another occaſion. By means of this compoſition the Chineſe drew all manner of figures on their paper.

Formerly the Chineſe wrote with a bodkin of iron on tablets of bamboo; afterwards on ſatin with a pencil; and during the dynaſty of their tyrants, about 160 years before Chriſt, they diſcovered the art of making paper.

The paper made from the bamboo is ſufficiently white, ſoft, cloſely united, without the leaſt inequality on the ſurface to interrupt the motion of the pencil, or to occaſion the riſing of the materials which compoſe it. Meanwhile every kind of paper made from the bamboo or the bark of trees, is readier to crack than that made in Europe; beſides, it is more ſuſceptible of moiſture, and ſooner deſtroyed with duſt and worms. To obviate this laſt inconveniency, they are obliged frequently to beat their books in China, and to expoſe them to the ſun. It may be obſerved, however, that the Chineſe paper, employed for various purpoſes in Europe, has been preſerved for a long time without receiving damage either from moiſture or inſects.

5
Japaneſe paper.

According to Kempfer, the bark of the *morus papifera ſativa*, or true paper tree, is chiefly employed for making paper in Japan. Every year after the fall of the leaves, which happens in the tenth month, correſponding to our December, the Japaneſe cut the young ſhoots of this tree into pieces of about three feet, collect them into parcels, which they boil in water into which they have caſt a certain quantity of aſhes. If the wood is dry, they take care to ſteep it 23 hours in water before it is boiled. The parcels are kept in a cloſe copper till the bark at the extremity of the ſhoots is ſeparated from the ſtem about half an inch; they are then cooled; and the bark alone is fit for making paper. They begin by a preparation which conſiſts of cleaning the bark, and ſeparating the good from the bad. For this purpoſe they ſteep it in water three or four hours; and as ſoon as it is ſoftened they ſcrape off with a knife whatever is blackiſh or green, and at the ſame time ſeparate the ſtrong bark of a year's growth from the ſlender which covers the young ſhoots. The firſt of theſe gives the whiteſt and beſt paper. If there is any of the bark of more than a year's growth, it is laid aſide for the coarſeſt.

After the bark has been culled and cleaned in this manner, it is boiled in a clear ley till the matter is of that conſiſtency, that, being touched gently with the finger, it draws off in the form of hairs, or like a collection of fibres. During the time of boiling it is conſtantly ſtirred with a ſtrong reed, and the waſte by evaporation ſupplied from time to time with additional quantities of the clear ley. To make this ley, they put two pieces of wood acroſs the mouth of a tub, cover them with ſtraw, on which they lay a bed of aſhes a little moiſtened; and pouring boiling water on the aſhes, the ſalts contained in them are carried down to the tub. This is what is called a *clear ly*.

After the bark is in the condition we have juſt now ſtated, it is waſhed with great care; for on this waſhing depends in a great meaſure the goodneſs of the paper. It is put into a kind of ſieve through which the water can flow freely; and great care is taken to turn it with the hand till it is ſufficiently diluted, and reduced to ſoft and tender fibres. For the fineſt paper a ſecond waſhing is requiſite, and a piece of cloth is uſed inſtead of a ſieve.

When the bark is waſhed, it is laid on a ſtrong and ſmooth table, and beat with a kind of baton of hard wood till it is reduced to a proper conſiſtency. It becomes indeed ſo ſoft, that it reſembles paper ſteeped in water.

The bark prepared in this manner is put into a narrow tub, with a glutinous extract from rice and the root oreni, which is very viſcous. Theſe three ſubſtances, mixed together, are ſtirred with the reed till they form a liquor of an equal and uniform conſiſtency. This compoſition is poured into tubs ſimilar to thoſe uſed for filling the forms in our paper mills.

As ſoon as the ſheets are made and detached from the form, they are laid in a heap on a table covered with a double mat. A ſmall chip of cane is placed betwixt every ſheet. This piece of cane jutting out, ſerves to diſtinguiſh the ſheets, and afterwards to raiſe them. Every one of the heaps is covered with a plate or thin board of the exact ſize of the paper. In proportion as the paper dries, or is able to bear it without danger of being compreſſed into one maſs, they lay on additional weights. This preſſure, intended to carry off any unneceſſary moiſture, is continued for 24 hours, when the ſheets are ſuſpended, by means of the little pieces of reed, to long plants, in the open air, till they are completely dried.

The extract from rice is made in an unvarniſhed earthen pot. The pot is agitated at firſt gently, then more briſkly: new water is poured in, and then it is filtered through a linen cloth. The finiſhing of the proceſs is determined by the viſcoſity of the ſubſtance.

The infuſion of the root oreni is made in the following manner: The root, peeled and cut into ſmall pieces, is infuſed into water for one night, during which time it communicates a viſcoſity ſufficient for the purpoſe to which it is applied.

The Japaneſe paper is of ſo prodigious a ſtrength, that the materials of which it is compoſed might be manufactured into ropes. There is ſold at Serige, the capital city of the province of Japan of that name, a kind of it fit for bed hangings and wearing apparel; reſembling ſo much ſtuffs of wool and ſilk, that it is often taken for them. The following is Kempfer's catalogue of trees uſed in Japan for the manufactory of paper. 1. The true paper tree, called in the Japaneſe language, *kaadſi*, Kempfer characterizes thus: *Papyrus fructu mori celſæ, ſive morus ſativa foliis urticæ mortuæ cortice papifera*. 2. The falſe paper tree, called by the Japaneſe, *katſi kadſire*; by Kempfer, *papyrus procumbens lacteſcens folio longo lanceata cortice chartaceo*. 3. The plant which the Japaneſe call *oreni* is named by Kempfer *alva radice viſcoſa flore ephemero magno punico*. 4. The fourth tree uſed for paper is the *futokadſura*, named by Kempfer *frutex viſcoſus procumbens folio telephii vulgaris æmulo fructu racemoſo*.

The deſcription of theſe trees, given more particularly by Kempfer than the limits of this work will permit, may be of great ſervice to lead botaniſts to diſcover the European plants and ſhrubs adapted, like the Japaneſe, for the fabrication of paper.

Before finiſhing our reflections on this part of the ſubject, it will be proper to give a juſt idea of the attempts which have been made to increaſe the original materials of paper in Europe.

A ſlight attention to the proceſs in China in reducing the bamboo to a paſte, by a careful and ingenious analyſis, and to the long and proper method of the Japaneſe of ſeparating the principal fibres of the bark of the mulberry, will ſhow the abſurdity not only of taking plants without any kind of choice, but of giving them no preparation except that of pounding them with mallets.

With a proper ſelection, and good principles, it appears not improbable that many of the European plants might be uſed with great advantage in conſtructing ſeveral kinds of paper.

It is evident that the materials uſed by the Chineſe require leſs labour and preparation than the ſtuff of linen rags. The ſheets of the Chineſe paper are eaſily detached from the form; they are laid in heaps without the interpoſition of pieces of woollen cloth; the ſuperfluous water is immediately diſcharged; and they require not, as in Europe, the vigorous action of preſſes to unite the parts more cloſely together.

6
Paper made from asbeſtos.

The aſbeſtos is a fibrous ſubſtance of little ſtrength, the threads of which are eaſily broken. This ſubſtance has the peculiar quality of ſupporting the action of fire without receiving any damage; whence pieces of cloth and garters made of it are incombuſtible. From the knowledge of this property paper has been made of the aſbeſtos. Dr. Brukman, profeſſor at Brunſwick, publiſhed the natural hiſtory of this foſſil; and four copies of his book, in the library of Wolfenbuttle, are on this paper.

The manner of fabricating this paper is deſcribed by M. Lloyd in the Philoſophical Tranſactions, N° 166. A certain quantity of the aſbeſtos is pounded in a mortar of ſtone till it be reduced to a ſubſtance like cotton. All the parts of earth or ſtone remaining in the aſbeſtos are then taken off by means of a fine ſieve, and it is formed into ſheets of paper by an ordinary paper mill. Mixing it with water reduces it to ſtuff; only, as it is heavier than that from linen rags, it requires to be continually ſtirred when they are taking it up with the frames. The only excellence of this paper is, that the writing diſappears when it is caſt into the fire. It muſt be obſerved, at the ſame time, that as it is of a ſlender conſiſtency, and eaſily torn, it is more an object of curioſity than uſe.

7
Paper made from rags.

This paper is manufactured through all Europe of linen rags collected in the cities and in the country. This kind of paper was utterly unknown to the ancients. The *libri lintei* mentioned by Livy, I. lib. iv. Pliny, XIII. c. xi. and by other Roman writers, are demonſtrated by Guilandin, in his commentary on Pliny, &c. to have been written on pieces of linen cloth, or canvaſs prepared in the manner of painters.

But it is not ſufficient to be certain that paper from linen is a modern invention; it is neceſſary to know by what nation, and at what period, it was diſcovered. Polydore Virgil, *De Inventoribus Rerum*, C. II. c. viii. confeſſes his ignorance of theſe facts. Scaliger, without any kind of proof, gives the glory to the Germans; and Count Maffei to the Italians. Other writers aſcribe this honour to ſome Greek refugees at Baſil, to whom the manner of making paper from cotton in their own country had ſuggeſted the idea. Du Halde is perſuaded that Europe derived this invention from the Chineſe, who, in ſeveral provinces, make paper of rags nearly in the ſame manner that we do. But this invention was practiſed by the Europeans before they had any communication with China, and before the taking of Conſtantinople, at which time the Greek refugees were ſuppoſed to have retired to Baſil. The preciſe time of this diſcovery in Europe is not exactly known. Father Mabillon believes that it was in the twelfth century; and cites a paſſage of Pierre de Clugny, born A. D. 1100, to prove it. The books which we read every day, ſays that abbé in his treatiſe againſt the Jews, are written on ſheeps and calfs ſkin; or on oriental plants; or, finally, *Ex raſuris veterum pannorum.* If theſe laſt words ſignify paper, ſuch as we uſe, there were books of it in the twelfth century. But this citation is the more to be ſuſpected, as Montfaucon himſelf, after the minuteſt ſearch in France and Italy, could find no book on this paper antecedent to the death of St Louis, A. D. 1270.

The epocha of this invention was not determined till 1762, M. Mierman having propoſed a reward to the perſon who could procure the moſt ancient manuſcript written on this kind of paper. The collection of all the memoirs ſent to him along with the manuſcripts was publiſhed at the Hague in 1767; and it appeared that this paper had been uſed in Europe before the year 1300.

In 1782 the Abbé Andrez publiſhed a work entitled *Dell' Origine, Progreſſi, e Stato attuale d'Ogni letteratura;* wherein he ſpeaks of the diſcovery of many kinds of paper, and particularly of that made of rags. The Abbé Andrez maintains, that paper made from ſilk was very anciently fabricated in China, and in the eaſtern parts of Aſia; that the art of making this paper was carried from China to Perſia about the year 652, and to Mecca in 706. The Arabs ſubſtituted cotton, the commodity of their own country, in place of ſilk or rather bamboo. This paper of cotton was carried into Africa and Spain by the Arabs. The Spaniards, from the quantity of linen to be found in the kingdom of Valencia, ſeem firſt to have adopted the idea of uſing linen rags; and the moſt ancient paper of this kind is of Valencia and Catalonia. From Spain it paſſed into France, as may be learned from a letter of Joinville to St Louis about the year 1260. It is diſcovered to have been in Germany in 1312, and in England in 1320 and 1342. In conſequence of the paper made from cotton in the Levant, the paper from linen was introduced much later into Italy. See the work of Abbé Andrez, printed at Parma, 1782, in 8vo; and Mierman's Collection, publiſhed at the Hague.

Art of Making Paper in Europe.

Sect. I. *Art of Making Paper in Europe.*

To give a conciſe view of this ſubject, it will be neceſſary to proceed with all the important parts of the operation in their order.

8
The ſelection of rags.

The ſelection of the rags, is the arranging of them into different lots, according to their quality and to the demand of the paper mill. In general this ſelection is very much neglected: The degrees of fineneſs and whiteneſs, diſtinguiſhed with little care, are thought to be the only objects of importance; whereas the hardneſs and ſoftneſs, the being more or leſs worn, are much more eſſential in this ſelection. It is certain, that a mixture of ſoft and hard rags occaſions much more loſs in the trituration than a difference in point of fineneſs or of colour. This exactneſs in the ſelection is ſtill more neceſſary where cylinders are uſed inſtead of mallets. We cannot do better than to give the method practiſed in Holland as worthy of imitation.

They begin by a general ſeparation of the rags into four lots; ſuperfine, fine, middle, and coarſe. Theſe lots are given to ſelectors, who ſubdivide each of them into five cheſts. They have beſides a bench, on which is fixed vertically a hook, and a piece of ſcythe which is terminated by a crooked point.

The perſon, for example, who has the charge of the fine lot, puts into one of the cheſts the hard rags, or thoſe which are little uſed, into another the ſoft, into a third the dirty, into a fourth thoſe which are ſtitched or hemmed, and, finally, into the fifth the ſuperfine rags which happen to be among the fine.

After this proceſs, the women who have the charge of it are at extreme pains to pick out every kind of ſewing, and eſpecially the knots of thread and the hems, by means of the hook or ſcythe which they have under their hands. They take care alſo by the ſame means to cut and reduce the rags exactly by the warp and the woof into ſmall pieces. It is of great advantage to cut or tear the pieces of rags by a thread, whether it be by the warp or woof; becauſe if it is done obliquely, many of the ends are loſt in the operation.

When they have ſelected a certain quantity of each of theſe ſubdiviſions, they are placed on an iron grate, which covers a large cheſt where they are beat, and otherwiſe turned, till the filth and duſt paſs through the bars of the grate and fall into the cheſt.

The number of lots in the ſelection of rags muſt be proportioned to the maſs from which the ſelection is made, and to the kinds of paper produced by the mill. Some mills, the work of which is conſiderable, make nine lots of their rags, five of which reſpect the fineneſs, and the reſt the cleanneſs and the colour. In ordinary mills there are only four lots, and in ſome two.

We have already obſerved, that the ſelection which regards the hardneſs of the materials is the moſt eſſential; becauſe it is of great importance to obtain ſtuff compoſed of equal parts, and without any loſs. But it is neceſſary to add, that the fineneſs and beauty of the paper depend in ſome caſes on a ſelection not rigorous. Thus, for example, it is of great ſervice to allow the middle to retain ſome part of the fine, and the fine ſome part of the ſuperfine ; for without this the inferior kinds of paper can never be of great value. The moſt common fault is to mix the rags of the inferior lots with the ſuperior; which though it augments the quantity of paper, is extremely injurious to the quality. It does much better to mix part of the ſuperior lots with the inferior. It was the want of attention to this mixture which makes ſome paper mills excel in the ſuperior ſorts of paper while the inferior kinds are of a very bad quality.

The ſelection of rags being made with exactneſs, however, and the lots being fermented and triturated ſeparately, the mixture may be made with much greater advantage when they are both reduced to ſtuff ; always taking care that it be in the ſame proportion as if it were in the ſtate of rags, and only in the manner which we juſt now mentioned ; for the inferior ſorts gain more in beauty and quality by this mixture than is loſt in ſtuff ; whereas if the fine ſtuff receives a certain quantity of the inferior, the paper is more damaged in its value than increaſed in quantity. In this manner the intereſt of the manufacturer, as in all caſes, is intimately connected with the goodneſs of his commodities.

The waſhing and fermentation of rags.

In ſome mills the place for fermentation is divided into two parts, one of which ſerves for waſhing away the filth from the rags. After allowing them to ſteep for ſome time in a large ſtone vat, they ſtir them, and pour in freſh water till the impurities connected with the rags run over. When they are as clean as they poſſibly can be made by this kind of waſhing, they are laid in a heap to putrefy. In this condition they experience a degree of fermentation, which is firſt diſcovered by a mouldineſs of the different pieces of cloth. Afterwards the maſs grows warm ; and then it is of great conſequence to attend to the progreſs of this heat, in order to moderate its effects : for this purpoſe, the middle of the heap, where the fermentation is ſtrongeſt, is turned out, and *vice verſa*. In mills where mallets are uſed, the putrefaction is carried to a great height, which is frequently attended with two inconveniences. The firſt is, that a part of the rags is reduced to an earthy ſubſtance, which is found in great abundance about the cutting table, as we ſhall afterwards have occaſion to ſee. But beſides this waſte, exceſſive fermentation makes the ſtuff incapable of ſuſtaining the action of the mallets till it is equally pounded. A paper made from a ſtuff too hard and too little fermented, is coarſe and ill compacted ; that made from rags too much fermented is compoſed of fibres without ſoftneſs and without ſtrength.

The ſecond inconveniency is, that the rags turn greaſy by too much fermentation, and of conſequence it is very difficult to ſeparate and reduce them by all the waſhings of the trituration.

We ſhall not deſcribe the form of the place for fermentation, becauſe in different paper works theſe places are of different conſtructions : it is ſufficient to ſay, that they are all placed in low ſituations and made very cloſe. The ſelected rags are placed in them in heaps, and watered from time to time to bring on the fermentation. In different paper mills they practiſe different methods in the putrefaction of their rags.

In certain provinces in France, they lay in the place for putrefaction a heap equivalent to what the mill can triturate in a month. When this is equally and ſufficiently moiſtened by means of moveable pipes, they cover it with an old heap, which has lain a month in a ſtate of fermentation. When this old heap is exhauſted by the mill, the new one becomes a covering to another, and ſo on. From this detail it is eaſy to perceive, that there muſt be near three weeks difference of putrefaction in the ſame heap, and alſo that in this method there is no allowance for thoſe ſeaſons in which the fermentation advances more rapidly.

In general the putrefaction goes on more ſlowly in proportion to the fineneſs of the rags. But when, on any occaſion, it advances more rapidly than the demand from the mill, the rags are turned over and watered, to ſtop the fermentation and prevent the bad effects.

All the inconveniences attending the exceſs of putrefaction are remedied in Holland by machines which triturate the rags without having recourſe to it ; and their ſucceſs in this manner of preparing the ſtuff has attracted the notice of the French artiſts, ſome of whom have adopted with advantage the Dutch machinery.

Meanwhile, it is poſſible to carry the method of putrefaction to much greater perfection ; and ſeveral manufacturers have made attempts ſo well concerted, as to deſerve the attention of thoſe who ſtudy the ſubject.

In the neighbourhood of Bruſſels ſome paper manufacturers, who have conſtructed their mills after the Dutch plan, have ſtill found it neceſſary to putrefy their rags ; but, at the ſame time, they have an excellent method for moderating the effects of this putrefaction. In the great galleries connected with the buildings of the paper mill, they have conſtructed a continuation of cheſts, capable each of them of containing a certain quantity of rags ; for example, the quantity which the cylinder can triturate in one day. The number of cheſts is equal to the number of days which the rags in any ſeaſon require for putrefaction ; and the number actually employed is greater or leſs according to the ſeaſon. In proſecuting this plan, they lay a heap of rags in one cheſt, as often as they take one from another. It ſhould alſo be obſerved, that, for the ſake of the fermentation, the rags are firſt moiſtened in a large hollow ſtone before they are arranged into the cheſts.

The peculiar advantages of this method are, the equal fermentation of the rags, without any part of them being weakened ; great eaſe in waſhing them ; and it is even pretended, that a leſs degree of fermentation renders the impurities and the diſcoloured parts both of hemp and linen more ſoluble, and conſequently the ſtuff of a purer white.

10
Cutting table.

When the rags are reduced to a proper ſtate of putrefaction, they are carried to the cutting table, which is placed on ſolid treſſels, and encloſed on three ſides to contain the rags cut on it. Before the table is fixed vertically a part of the blade of a ſcythe, the edge of which is turned from the operator. This workman, in a ſituation rather elevated, takes from the left ſide a handful of the putrefied rags, and arranging them the long way, gives them a gentle twiſt, preſſes the half-formed rope againſt the blade of the ſcythe, and, in the manner of ſawing, cuts it into three or four pieces, which he throws to the right ſide of the table. In this operation the rags loſe part of their filth, and eſpecially of the earthy particles occaſioned by too much putrefaction.

11
Mills for triturating the rags.

When the rags have been ſubmitted to all the foregoing operations, they are in a condition to be reduced into a fibrous ſtuff, of which the paper is made. To obtain this ſtuff, mills are conſtructed on different principles. Thoſe which have been uſed for a long time over all Europe, and which by a ſtatement in the *Encyclopédie Methodique*, publiſhed at Paris in 1789, are ſtill uſed in France, are mills with mallets. But the mills invented by the Dutch, and uſed in the neighbouring provinces, and, excepting one inſtance, in every part of Great Britain, are mills with cylinders or rollers. In the former of theſe, the mallets are raiſed by notches fixed at convenient diſtances in a large circular beam of wood. The teeth fixed on the end of the mallet fall into a correſponding gap made the whole breadth of the plate, and the ſtrokes are repeated till the rags are reduced to a proper conſiſtency. On ſupplying the vat with water, and carrying off all the impurities, the operation is nearly ſimilar to that in the mills with cylinders.

Such is the nature of what may be called the *old method of making paper*. It was proper to ſpeak of this old method, becauſe at one time, and that not very diſtant it univerſally prevailed. That it was inferior to that now in practice, ſeems very evident; and that the rotting of the rags was peculiarly abſurd, cannot be denied, as the paper made of fermented ſtuff could neither be ſo ſtrong nor ſo durable as that which is made in the common way without putrefaction. The only kind of paper that, with any propriety, could be made from putrified ſtuff, was paſteboard; but we are informed by the moſt intelligent papermakers in Britain, that they ſeldom or never even putrefy the rags or ropes of which paſteboard is made. It will now be requiſite to ſtate the method preſently in practice, with the improvements lately made in the art.

12
The duſter.

The duſter is made in the form of a cylinder, four and a half feet in diameter, and five feet in length. It is altogether covered with a wire net, and put in motion by its connexion with ſome part of the machinery. A convenient quantity of rags before the ſelection are encloſed in the duſter, and the rapidity of its motion ſeparates the duſt from them, and forces it through the wire. It is of conſiderable advantage to uſe the duſter before ſelection, as it makes that operation leſs pernicious to the ſelectors.

The ſelection is performed much in the ſame manner as we have already deſcribed; only it is found more convenient to have the tables for cutting off the knots and ſtitching, and for forming them into a proper ſhape, in the ſame place with the cutting table. The ſurface both of theſe and of the cutting table is compoſed of a wire net, which in every part of the operation allows the remaining duſt and refuſe of every kind to eſcape.

The rags, without any kind of putrefaction are again carried from the cutting table back to the duſter, and from thence to the engine, where, in general, they are in the ſpace of ſix hours reduced to the ſtuff proper for making paper. The hard and ſoft of the ſame quality are placed in different lots; but they can be reduced to ſtuff at the ſame time, provided the ſoft be put ſomewhat later into the engine.

13
Deſcription of a paper mill.

The engine is that part of the mill which performs the whole action of reducing the rags to paſte, or, as it may be termed, of trituration. The number of the engines depends on the extent of the paper work, on the force of water, or on the conſtruction of the machinery.

It will afford a ſufficient idea of the work, to give in detail a deſcription of the different parts of the engine. See Plate CCCLXXVI. Figure 1. repreſents the chapiter which covers the roller. It is four feet three inches in length, and two feet eight inches in breadth. The ſuperior part is pierced with two openings running croſſwiſe, 1, 2, 3, 4, into which enter the chaſſes, or wicker frames, figures 6, and 7.; the firſt, made of wire cloth, enters into the opening 3 and 4; the ſecond made of hair cloth, and ſtrengthened with ſeveral croſs bars of wood, enters into the opening 1, 2, ſerves to retain the ſmall pieces of rags which eſcape through the firſt, and prevents them from falling into the dalot or hole-ſcupper, fig. 2. This hole-ſcupper is placed acroſs the vat of the engine, parallel to the axle of the roller; the part 9 enters into the notch *c* of the chapiter; and the extremity *h* enters into the opening *k* of the tunnel *kl* (fig. 3.), by which means the water daſhed through the wicker frames by every revolution of the roller is precipitated into the canal *fh*, and loſes itſelf below the engine. The figures 4, 9, and 10, repreſent the roller in perſpective, in plane, and in profile. It is two feet in diameter, and two feet three inches in length. The trundle head A is 16 inches in diameter, about half as much in length, and furniſhed with ſeven ſpindles of iron, which are ſcrewed to the end of the trundle head, made alſo of iron. The teeth or blades of the roller are 27 in number, and fitted ſtrongly into the wood which compoſes its body, parallel to its axis. They are of that thickneſs as to leave as much empty ſpace as they occupy. The exterior face of each of the blades ſhould be made round, and divided into two parts, with a longitudinal motion, as in the profile *a a a*, fig. 10.

The axis AB of the roller (fig. 4. and 9.) has two parts perfectly rounded in A and in B, which perform the office of pivots. Theſe pivots reſt in the ſockets A and B (fig. 8.) in the middle of the levers OAH and OBH. It is by means of theſe levers that they raiſe at pleaſure, or lower the axis of the roller, and fit it exactly, and in a parallel manner, to the plate. The plates (ſee fig. 5.) are made of ſteel cut into channels, in ſuch a manner as to correſpond with the blades of the roller. Their channels are not perpendicular, but oblique; and there are two rows of them, *b x*, *x d*, conſiſting of ſeven or eight blades each on one plate.—Thoſe in *b x*, for the purpoſe of changing the plate, lie in an oppoſite direction to thoſe in *x d*. The levers are kept in their poſition near the vat by bands of iron, MN and *mn*; between which they are made higher or lower by the cogged wheel H, which ſupports one of the extremities. Wedges N *n* are likewiſe employed to fix the levers at a convenient height above the plates. Finally, Every vat is ſupplied with a ſmall ſlide door, which is occaſionally raiſed to carry the prepared ſtuff by means of the ſcuppers of wood to the general repoſitories.

14 Working of the engine.

Fig. 5. is placed in the vat fig. 8.; the roller (fig. 4.) is placed above it in ſuch a manner that the pivots reſt in the ſockets of the levers; the ſcupper (fig. 2.) and the chapiter are diſpoſed in the manner above mentioned. The vat is charged with a proper quantity of rags, and freſh water is admitted by a ſpigot placed at one of the corners. In this ſituation, when the engine is put in motion, the roller turning upon its axis draws the water and the rags by the leaſt inclined plane, and making them paſs between its blades and the channels of the plate, daſhes them againſt the chapiter and the wicker-frames; and, in ſhort, part of them falls back into the vat, and returns into the circulation. The cauſe of this circulation is evidently the continual void occaſioned by the movement of the roller on the one ſide, and the return of the water and the ſtuff on the other.

As all the rags are not thrown towards the part B*d* of the chapiter, from whence they might fall back into the vat, but a part of them to a greater diſtance; it is neceſſary to have the wicker frames formerly deſcribed, not only to prevent their loſs, but to allow the dirty water to eſcape. The ſpigot at the corner of the vat continually ſupplies this waſte of water. This operation would be ſufficient to whiten the rags, although the rollers were raiſed conſiderably from the plate; and therefore the force and action of the rollers reducing them to ſtuff muſt be much more effectual. It requires great ſkill to conduct the engine, whether it be with regard to the firſt quantity, to the proper time for adding the ſofter rags, to the augmenting or diminiſhing the water in proportion to the trituration; or, finally, to knowing exactly when the ſtuff is reduced to a proper conſiſtency.

In the paper manufactory at Montargis, it was attempted to introduce rollers of the greateſt ſtrength and the leaſt weight poſſible, in order to give them the greater rapidity; but the experiment did not ſucceed: the rollers of prodigious rapidity were found to produce ſtuff neither in greater quantity nor of ſuperior quality. The moſt experienced artiſts have eſtabliſhed a proportion between the motion of the roller and the greater or leſs reſiſtance of the rags. And the Dutch, who have arrived at very great perfection in this art, have followed a method totally different from that practiſed at Montargis. A roller in Holland complete in all its parts weighs nearly 30 hundred weight; and they find this neceſſary for cutting the rags, eſpecially if they have not been putrefied. In proportioning the rapidity to the reſiſtance, they have alſo diſcovered, that a ſlow motion is preferable to a rapid one. The rollers at Saardom, by calculation made from the different parts of the machinery, make about 68 revolutions in a minute; thoſe at Montargis about 166.—In Holland, too, this trituration of the rags is divided into two diſtinct operations, performed by rollers conſtructed on different principles: the firſt of them, for cutting the rags and preparing for the other, is furniſhed with blades of ſteel without any moiſture, and with a conſiderable ſpace between them; the ſecond, intended to reduce the ſtuff to the proper conſiſtency, has a greater number of blades, compoſed of a mixture of braſs and copper. The mills with rollers are in every reſpect ſuperior to thoſe formerly in uſe with mallets. Two Dutch rollers of the conſtruction we have juſt now deſcribed will prepare as much ſtuff in the ſame time as 24 mallets; they require infinitely leſs room; they do it without putrefaction, and as they do it in leſs time, and with leſs water, they occaſion much leſs waſte of the ſtuff.

When the ſtuff is brought to perfection, it is conveyed into a general repoſitory, which ſupplies the vat from which the ſheets of paper are formed. This vat is made of wood, and generally about five feet in diameter, and two and a half in depth. It is kept in temperature by means of a grate introduced by a hole, and ſurrounded on the inſide of the vat with a caſe of copper. For fuel to this grate, they uſe charcoal or wood; and, frequently, to prevent ſmoke, the wall of the building comes in contact with one part of the vat, and the fire has no communication with the place where they make the paper.

Every vat is furniſhed on the upper part with planks, encloſed inwards, and even railed in with wood, to prevent any of the ſtuff from running over in the operation. Acroſs the vat is a plank which they call the *trapan*, pierced with holes at one of the extremities, and reſting on the planks which ſurround the vat.

The forms or moulds are compoſed of wire-cloth, and a moveable frame. It is with theſe that they fetch up the ſtuff from the vat, in order to form the ſheets of paper. The ſides of the form are made of oak, which is previouſly ſteeped in water, and otherwiſe prepared to prevent warping. The wire-cloth is made larger than the ſheet of paper, and the exceſs of it on all ſides is covered with a moveable frame. This frame is neceſſary to retain the ſtuff of which the paper is made on the cloth; and it muſt be exactly adapted to the form, otherwiſe the edges of the paper will be ragged and badly finiſhed. The wire-cloth of the form is varied in proportion to the fineneſs of the paper and the nature of the ſtuff.

The felts are pieces of woollen cloth ſpread over every ſheet of paper, and upon which the ſheets are laid, to detach them from the form, to prevent them from adhering together, to imbibe part of the water with which the ſtuff is charged, and to tranſmit the whole of it when placed under the action of the preſs. The two ſides of the felt are differently raiſed: that of which the hair is longeſt is applied to the ſheets which are laid down; and any alteration of this diſpoſition would produce a change in the texture of the paper. The ſtuff of which the felts are made ſhould be ſufficiently ſtrong, in order that it may be ſtretched exactly on the ſheets without forming into folds; and, at the ſame time, ſufficiently pliant to yield in every direction without injury to the wet paper. As the felts have to reſiſt the reiterated efforts of the preſs, it appears neceſſary that the warp be very ſtrong, of combed wool, and well twiſted. On the other hand, as they have to imbibe a certain quantity of water, and to return it, it is neceſſary that the woof be of carded wool, and drawn out into a ſlack thread.—Theſe are the utenſils, together with the preſs, which are uſed in the apartment where the ſheets of paper are formed.

15 The fabrication of paper.

The vat being furniſhed with a ſufficient quantity of ſtuff and of water, two inſtruments are employed to mix them; the one of which is a ſimple pole, and the other a pole armed with a piece of board, rounded and full of holes. This operation is repeated as often as the ſtuff falls to the bottom. In the principal writing mills in England, they uſe for this purpoſe what is called a *hog*, which is a machine within the vat that, by means of a ſmall wheel on the outſide, is made to turn conſtantly round, and keep the ſtuff in perpetual motion. When the ſtuff and water are properly mixed, it is eaſy to perceive whether the previous operations have been complete. When the ſtuff floats cloſe, and in regular flakes, it is a proof that it has been well triturated; and the parts of the rags which have eſcaped the rollers alſo appear.

After this operation the workman takes one of the forms, furniſhed with its frame, by the middle of the ſhort ſides, and fixing the frame round the wire-cloth with his thumbs, he plunges it obliquely four or five inches into the vat, beginning by the long ſide, which is neareſt to him. After the immerſion he raiſes it to a level: by theſe movements he fetches up on the form a ſufficient quantity of ſtuff; and as ſoon as the form is raiſed the water eſcapes through the wire-cloth, and the ſuperfluity of the ſtuff over the ſides of the frame. The fibrous parts of the ſtuff arrange themſelves regularly on the wire-cloth of the form, not only in proportion as the water eſcapes, but alſo as the workman favours this effect by gently ſhaking the form. Afterwards, having placed the form on a piece of board, the workman takes off the frame or deckle, and glides this form towards the coucher; who, having previouſly laid his felt, places it with his left hand in an inclined ſituation, on a plank fixed on the edge of the vat, and full of holes. During this operation the workman applies his frame, and begins a ſecond ſheet. The coucher ſeizes this inſtant, takes with his left hand the form, now ſufficiently dry, and laying the ſheet of paper upon the felt, returns the form by gliding it along the trepan of the vat.

They proceed in this manner, laying alternately a ſheet and a felt, till they have made ſix quires of paper, which is called a *poſt*; and this they do with ſuch ſwiftneſs, that, in many ſorts of paper, two men make upwards of 20 poſts in a day. When the laſt ſheet of the poſt is covered with the laſt felt, the workmen about the vat unite together, and ſubmit the whole heap to the action of the preſs. They begin at firſt to preſs it with a middling lever, and afterwards with a lever about fifteen feet in length. After this operation another perſon ſeparates the ſheets of paper from the felts, laying them in a heap; and ſeveral of theſe heaps collected together are again put under the preſs.

16 Grain of paper.

The ſtuff which forms a ſheet of paper is received, as we have already ſaid, on a form made of wire-cloth, which is more or leſs fine in proportion to the ſtuff, and ſurrounded with a wooden frame, and ſupported in the middle by many croſs bars of wood. In conſequence of this conſtruction, it is eaſy to perceive, that the ſheet of paper will take and preſerve the impreſſions of all the pieces which compoſe the form, and of the empty ſpaces between them.

The traces of the wire-cloth are evidently perceived on the ſide of the ſheet which was attached to the form, and on the oppoſite ſide they form an aſſemblage of parallel and rounded riſings. As in the paper which is moſt highly finiſhed the regularity of theſe impreſſions is ſtill viſible, it is evident that all the operations to which it is ſubmitted have chiefly in view to ſoften theſe impreſſions without deſtroying them.— It is of conſequence, therefore, to attend to the combination of labour which operates on theſe impreſſions. The coucher, in turning the form on the felt, flattens a little the rounded eminences which are in relievo on one of the ſurfaces, and occaſions at the ſame time the hollow places made by the wire-cloth to be partly filled up. Meanwhile the effort which is made in detaching the form, produces an infinite number of ſmall hairs on every protuberant part of the ſheet.

Under the action of the preſs, firſt with the felts and then without them, the perfecting of the grain of paper ſtill goes on. The veſtiges of the protuberances made by the wires are altogether flattened, and of conſequence the hollows oppoſite to them diſappear alſo; but the traces formed by the interſtices of the wire, in conſequence of their thickneſs, appear on both ſides, and are rounded by the preſs.

The riſings traced on each ſide of the paper, and which can be diſcovered by the eye on that which is moſt highly finiſhed, from what is called the *grain of paper*. The different operations ought to ſoften but not deſtroy it; which is effectually done by employing the hammer. This grain appears in the Dutch paper; which is a ſufficient proof, that though they have brought this part of the art to the greateſt perfection, they have not employed hammers, but more ſimple and ingenious means. The grain of paper is often disfigured by the felts when they are too much uſed, or when the wool does not cover the thread. In this caſe, when the paper is ſubmitted to the preſs, it takes the additional traces of the warp and the woof, and compoſes a ſurface extremely irregular.

The paper, the grain of which is highly ſoftened, is much fitter for the purpoſes of writing than that which is ſmoothed by the hammer: on the other hand, a coarſe and unequal grain very much oppoſes the movements of the pen; as that which is beat renders them very uncertain. The art of making paper, therefore, ſhould conſiſt in preſerving, and at the ſame time in highly ſoftening, the grain: the Dutch have carried this to the higheſt perfection.

17 Exchange.

The exchange ſucceeds the operation laſt deſcribed. It is conducted in a hall contiguous to the vat, ſupplied with ſeveral preſſes, and with a long table. The workman arranges on this table the paper, newly fabricated, into heaps; each heap containing eight or ten of thoſe laſt under the preſs, kept ſeparate by a woollen felt. The preſs is large enough to receive two of them at once, placed the one at the other's ſide. When the compreſſion is judged ſufficient, the heaps of paper are carried back to the table, and the whole turned ſheet by ſheet, in ſuch a manner that the ſurface of every ſheet is expoſed to a new one; and in this ſituation they are again brought under the preſs. It is in conducting theſe two operations ſometimes to four or five times, or as often as the nature of the paper requires, that the perfection of the Dutch plan conſiſts. If the ſtuff be fine, or the paper ſlender, the exchange is leſs frequently repeated. In this operation it is neceſſary to alter the ſituation of the heaps, with regard to one another, every time they are put under the preſs; and alſo, as the heaps are higheſt toward the middle, to place ſmall pieces of felt at the extremities, in order to bring every part of them under an equal preſſure. A ſingle man with four or five preſſes may exchange all the paper produced by two vats, provided the previous preſſing at the vats be well performed. The work of the exchange generally laſts about two days on a given quantity of paper.

When the paper has undergone theſe operations, it is not only ſoftened in the ſurface, but better felted, and rendered more pliant in the interior parts of the ſtuff. In ſhort, a great part of the water which it had imbibed in the operation of the vat is diſſipated. By the felting of paper is underſtood the approximation of the fibres of the ſtuff, and their adhering more cloſely together. The paper is felted in proportion as the water eſcapes; and this effect is produced by the management and reiterated action of the preſs. Were it not for the gradual operation of the preſs, the paper would be porous and compoſed of filaments adhering cloſely together. The ſuperiority of the Dutch over the French paper depends almoſt entirely on this operation.

If the ſheets of paper are found to adhere together, it is a proof that the buſineſs of the preſs has been badly conducted. To avoid this inconveniency, it is neceſſary to bring down the preſs at firſt gently, and by degrees with greater force, and to raiſe it as ſuddenly as poſſible. By this means the water, which is impelled to the ſides of the heaps, and which has not yet eſcaped, returns to the centre; the ſheets are equally dry, and the operation executed without difficulty.

According to the ſtate of dryneſs in which the paper is found when it comes from the apartment of the vat, it is either preſſed before or after the firſt exchange. The operation of the preſs ſhould be reiterated and managed with great care; otherwiſe, in the ſoft ſtate of the paper, there is a danger that its grain and tranſparency be totally deſtroyed. Another eſſential principle to the ſucceſs of the exchange is, that the grain of the paper be originally well raiſed. For this purpoſe the wire cloth of the Dutch forms is compoſed of a rounder wire than thoſe uſed in France, by which they gain the greateſt degree of tranſparency, and are in no danger of deſtroying the grain. Beſides this, the Dutch take care to proportion the wires even where the forms are equal to the thickneſs of the paper.

Almoſt every kind of paper is conſiderably improved by the exchange, and receives a degree of perfection which renders it more agreeable in the uſe. But it is neceſſary to obſerve at the ſame time, that all papers are not equally ſuſceptible of this melioration; on the contrary, if the ſtuff be unequal, dry, or weakened by the deſtruction of the fine parts, it acquires nothing of that luſtre and ſoftneſs, and appearance of velvet, which the exchange gives to ſtuffs properly prepared.

18
Of the drying of paper.

The ſheds for drying the paper are in the neighbourhood of the paper mill; and are furniſhed with a vaſt number of cords, up which they hang the ſheets both before and after the ſizing. The ſheds are ſurrounded with moveable lattices, to admit a quantity of air ſufficient for drying the paper. The cords of the ſhed are ſtretched as much as poſſible; and the paper, four or five ſheets of it together, is placed on them by means of a wooden inſtrument reſembling a pickaxe. The principal difficulty in drying the paper, conſiſts in gradually admitting the external air, and in preventing the cords from imbibing moiſture. With regard to the firſt of theſe, the Dutch uſe very low ſheds, and conſtruct their lattices with great exactneſs. By this means the Dutch paper is dried equally, and is extremely ſupple before the ſizing. They prevent the cords from imbibing the water by covering them with wax. In uſing ſuch cords, the moiſture does not continue in the line of contact between the paper and the cord, which prevents the ſheet from ſtretching in that particular place by its weight, and from the folds which the moiſture in the ſubſequent operations might occaſion. The Dutch alſo employ cords of conſiderable thickneſs, and place fewer of them under the ſheets; by which means they diminiſh the points of contact, and give a freer and more equal circulation to the air.

19
Of the ſizing of paper.

The ſize for paper is made of the ſhreds and pairings got from the tanners, curriers, and parchment makers. All the putrified parts and the lime are carefully ſeparated from them, and they are encloſed into a kind of baſket, and let down by a rope and pulley into the cauldron. This is a late invention, and ſerves two valuable purpoſes. It makes it eaſy to draw out the pieces of leather when the ſize is extracted from them by boiling, or eaſy to return them into the boiler if the operation be not complete. When the ſubſtance is ſufficiently extracted, it is allowed to ſettle for ſome time; and it is twice filtered before it is put into the veſſel into which they dip the paper.

Immediately before the operation, a certain quantity of alum is added to the ſize. The workman takes a handful of the ſheets, ſmoothed and rendered as ſupple as poſſible, in his left hand, dips them into the veſſel, and holds them ſeparate with his right, that they may equably imbibe the ſize. After holding them above the veſſel for a ſhort ſpace of time, he ſeizes on the other ſide with his right hand, and again dips them into the veſſel. When he has finiſhed ten or a dozen of theſe handfuls, they are ſubmitted to the action of the preſs. The ſuperfluous ſize is carried back to the veſſel by means of a ſmall pipe. The veſſel in which the paper is ſized is made of copper, and furniſhed with a grate, to give the ſize when neceſſary a due temperature; and a piece of thin board or felt is placed between every handful as they are laid on the table of the preſs.

The Dutch are very careful, in ſizing their paper, to have every ſheet in the ſame handful of equal dryneſs; becauſe it is found that the dry ſheets imbibe the ſize more ſlowly than thoſe which retain ſome degree of moiſture. They begin by ſelecting the *padges* in the drying houſe; and after having made them ſupple, and having deſtroyed the adherence between the ſheets, they ſeparate them into handfuls in proportion to the dryneſs, each of them containing that number which they can dip at one time. Beſides this precaution, they take care to apply two ſheets of brown paper of an equal ſize to every handful. This brown paper, firm, ſolid, and already ſized, is of uſe to ſupport the ſheets.

As ſoon as the paper is ſized, it is the practice of ſome paper mills to carry it immediately to the drying houſe, and hang it before it cools ſheet by ſheet on the cords. The paper, unleſs particular attention be paid to the lattices of the drying houſe, is apt to dry too faſt, whereby a great part of the ſize goes off in evaporation; or, if too ſlow, it falls to the ground. The Dutch drying houſes are the beſt to prevent theſe inconveniences:—But the exchange after the ſizing, which is generally practiſed in Holland, is the beſt remedy. They begin this operation on the handfuls of paper, either while they are ſtill hot, or otherwiſe as they find it convenient. But, after the exchange, they are careful to allow the heaps to be altogether cold before they are ſubmitted to the preſs. Without this precaution, the ſize would either be wholly ſqueezed out by the preſs of the exchange, or the ſurface of the paper become very irregular. It is of conſequence that the paper, ſtill warm from the ſizing, grow gradually firm, under the operation of the exchange, in proportion as it cools. By this method it receives that varniſh which is afterwards brought to perfection under the preſs, and in which the excellency of the paper either for writing or drawing chiefly conſiſts. It is in conſequence of the exchanging and preſſing that the Dutch paper is ſoft and equal, and that the ſize penetrates into the body of it, and is extended equally over its ſurface.

The exchange after the ſizing ought to be conducted with the greateſt ſkill and attention, becauſe the grain of the paper then receives impreſſions which can never be eradicated. When the ſized paper is alſo exchanged, it is poſſible to hang more ſheets together on the cords of the drying houſe. The paper dries better in this condition, and the ſize is preſerved without any ſenſible waſte, becauſe the ſheets of paper mutually prevent the rapid operation of the external air. And as the ſize has already penetrated into the paper, and is fixed on the ſurface, the inſenſible progreſs of a well conducted drying houſe renders all the good effects more perfect in proportion as it is ſlowly dried.

If to theſe conſiderations be added the damage done to the paper in drying it immediately after the preſs of the ſizing room, whether it be done in raiſing the hairs by ſeparating the ſheets, or in cracking the ſurface, it is evident that the trouble of the ſecond exchange is infinitely overpaid by the advantage.

20
Of the finiſhing room.

When the paper is ſufficiently dry, it is carried to the finiſhing room, where it is preſſed, ſelected, examined, folded, made up into quires, and finally into reams.—It is here put twice under the preſs; firſt, when it is at its full ſize, and ſecondly, after it is folded.

The principal labour of this place conſiſts in aſſorting the paper into different lots, according to its quality and faults; after which it is made up into quires. The perſon who does this muſt poſſeſs great ſkill, and be capable of great attention, becauſe he acts as a check on thoſe who ſeparated the paper into different lots. He takes the ſheets with his right hand, folds them, examines them, lays them over his left arm till he has the number requiſite for a quire, brings the ſides parallel to one another, and places them in heaps under the table. An expert workman, if proper care has been taken in aſſorting the lots, will finiſh in this manner near 600 quires in a day.

The paper is afterwards collected into reams of 20 quires each, and for the laſt time put under the preſs, where it is continued for 10 or 12 hours, or as long as the demand of the paper mill will permit.

21
A new method of bleaching the rags or ſtuff.

A method has lately been diſcovered of bleaching the rags or ſtuff, which will undoubtedly be adopted everywhere in the preparation of writing paper, provided the expence of the proceſs be not too great. This diſcovery was made by Scheele, M. Berthollet, and M. Chaptal. The firſt of theſe illuſtrious writers communicated to the Swediſh Academy of Sciences an Eſſay on Manganeſe, containing a numerous ſeries of experiments, intended to inveſtigate the nature and properties of that ſubſtance. Among theſe experiments were ſeveral which pointed out a new ſtate of the muriatic acid, or the acid diſtilled from ſea ſalt, otherwiſe known under the name of the *acid* or *ſpirit of ſea ſalt*. This ſtate of the muriatic acid was produced by Mr Scheele, in conſequence of putting the ſaid acid into a retort or diſtilling veſſel, along with the above-mentioned ſubſtance called *manganeſe*, and diſtilling over the acid into a proper receiver; it was found to have changed its nature and properties in a very remarkable manner, while at the ſame time the manganeſe remaining in the retort had ſuffered a very material alteration.

To the new ſtate of the acid thus produced, in conſequence of certain theoretic ideas which Mr Scheele entertained reſpecting the mutual action of the original muriatic acid and the manganeſe on each other during the proceſs of diſtillation, he gave the name of *dephlogiſticated muriatic acid*. Since the time of this original diſcovery, in conſequence of certain changes which have occurred in the theory or philoſophy of chemiſtry, this new ſtate of the acid of ſea ſalt has been called the *oxygenated muriatic acid*. Among many other properties of it diſcovered by Mr Scheele, the moſt remarkable was, that it deſtroyed the colour of every vegetable ſubſtance which was expoſed to its action; or, in other words, it bleached them; or, in the language of the dyers, it diſcharged their colours; that is to ſay, whatever happened to be the colour of any vegetable body that was ſubmitted to the action of the oxygenated or dephlogiſticated muriatic acid, it always became white, or loſt its colouring matter.

In the year 1786, Dr Bedoes, now profeſſor of chemiſtry in the univerſity of Oxford, publiſhed an Engliſh tranſlation of the Chemical Eſſays of Mr Scheele; and thereby made known to the chemiſts of Great Britain the power of the oxygenated or dephlogiſticated muriatic acid, to bleach or whiten vegetable ſubſtances, or to diſcharge or decompoſe their colours. But M. Berthollet, a celebrated chemiſt in France, and one of the members of the Academy of Sciences at Paris, appears to have been the firſt who thought of rendering the above recited diſcovery ſubſervient to the purpoſes of manufacture.

In 1789, he publiſhed in the *Annales de Chimie* an eſſay calculated entirely for the uſe of manufacturers, by being diveſted of theoretic diſcuſſions; of which the title is, "Method of bleaching linen or cotton cloths, threads, and yarns, by means of oxygenated muriatic acid, and of ſome other properties of that liquor which may be uſeful in manufactures."

In the ſame work, and in the ſame year, M. Chaptal, another French chemiſt, publiſhed an account of ſome experiments, in which, among many other applications of the oxygenated muriatic acid to purpoſes uſeful in the economical arts, he gives information of having bleached or whitened coarſe rags uſed by the papermakers, ſo as greatly to improve the quality of the paper into which they were afterwards manufactured. His preparation of this bleaching liquor differs not from Berthollet's, which is as follows: "Take ſix ounces of mangane ſe and ſixteen ounces of ſea ſalt, both reduced to a fine powder; mix theſe accurately, and introduce them into a retort or diſtilling veſſel: Then take twelve ounces of oil of vitriol and eight ounces of water, mixed together, and allowed to cool; add theſe to the other ingredients in the retort, and connect the retort with a caſk or receiver capable of holding twenty-ſeven gallons and a half of water, but only containing twenty-five gallons, which is to be impregnated with the gas or vapour of the oxygenated muriatic acid; and proceed to diſtillation, firſt without and afterwards with a fire gradually raiſed, till the whole acid comes over.

Experiments have been made with this liquor both by ſome of the principal papermakers in the neighbourhood of Edinburgh and by Meſſrs Clement and George Taylors of Maidſtone in Kent. By the former it was found, that paper made of rags and pulp whitened in this manner, was ſuperior to any other made of ſimilar materials, not only in colour but in fineneſs of texture. By the latter, the excellence of the liquor was found to be ſo great, that probably having never heard of Scheele, Berthollet, and Chaptal, and conceiving themſelves to be the firſt inventors of it, they obtained a patent for its excluſive uſe, which other manufacturers will doubtleſs diſregard. It is not to be concealed, however, that, even with all the precautions which can poſſibly be taken at firſt, various circumſtances of imperfection muſt neceſſarily remain to be removed by means of farther experience, both in the perfection of the bleaching proceſs and the economy of its application to uſe; but for the attaining of this experience a ſhort time will rarely be ſufficient.

Sect. II. *Of the different Kinds of Paper.*

22 Writing paper.

The paper proper for writing ſhould be without knots, without any parts of the ſtuff not triturated, without folds, and without wrinkles, of a ſupple texture, its grain uniform and regular, ſoftened in the exchange, and not deſtroyed by ſmoothing. The ground of this paper muſt be extremely white, or ſhaded with a very light blue, which adds to its natural ſplendour. It is of great importance that it be fully and equally ſized, otherwiſe the writing cannot be well finiſhed, and the turnings of the letters will be very imperfect. This paper ſhould be made from ſtuff not putrefied, which takes a better grain, receives more benefit from the exchange, is more equally ſized, and finally, is leſs ſubject to folds and wrinkles in the different operations.

23 For durable writing.

To make paper peculiarly fit for durable writing, Dr Lewis recommends the impregnation of it with aſtringent materials. "It is obſervable (ſays he) that writings firſt begin to fade or change their colour on the back of the paper, where the larger ſtrokes have ſunk in, or are viſible through it: as if part of the irony matter of the vitriol was in a more ſubtile or diſſolved ſtate than the reſt, and ſunk further, on account of its not being fully diſengaged from the acid, or ſufficiently combined with the aſtringent matter of the galls. Hence, it ſhould ſeem probable, that if the paper was impregnated with aſtringent matter, the colour of the ink would be more durable. To ſee how far this notion was well founded, I dipt ſome paper in an infuſion of galls; and, when dry, repeated the dipping a ſecond and third time. On the paper thus prepared, and ſome that was unprepared, I wrote with different inks; ſeveral of which, that the effects might be more ſenſible, had an over-proportion of vitriol. The writings being expoſed to the weather till the beſt of the inks on the unprepared paper had faded and changed their colour, thoſe on the prepared paper were all found to retain their blackneſs. It is therefore recommended to the conſideration of the papermakers, whether a particular kind of paper might not be prepared for thoſe uſes where the long duration of the writing is of principal importance, by impregnating it with galls or other aſtringents, in ſome of the operations it paſſes through before it receives the glazing; as for inſtance, by uſing an aſtringent infuſion, inſtead of common water, in the laſt operation, when the matter is reduced into a pulp for being formed into ſheets. The browniſh hue which the paper receives from the galling, would not perhaps be any great obſtacle to its uſe; and, if the propoſal ſhould be thought worthy of being carried into execution, further inquiries may poſſibly diſcover the means of obviating the imperfection, and communicating aſtringency without colour.

24 Paper fit for drawing, or for coloured maps.

The paper uſed for drawing, or for coloured maps, is in ſome mills made from one kind of white ſtuff, either fine or middling; in others, from a mixture of three or four kinds of ſtuff of different colours. The Dutch were not long ago almoſt wholly in poſſeſſion of this manufacture. The ſame qualities are neceſſary in this paper as in that for writing. The grain, however, muſt be a little more raiſed, although ſoftened by the exchange; for, without this grain, the pencil would leave with difficulty the traces of the objects. Great care is alſo neceſſary in the ſizing of this paper, that the drawing be neatly performed, and alſo that the ſinking of the ink or colours into the irregularities of the ſtuff be prevented.

25 Of furniture paper.

This paper is alſo made in the greateſt perfection by ſtuffs not rotted. Theſe take a more even gloſs, and are in better condition to receive all the impreſſions of the painter. It is alſo neceſſary that furniture paper be well ſoftened, and ſubmitted to the exchange, to take more exactly the outlines of the figures. The French have carried this part of the manufacture of paper to the higheſt ſtate of perfection.

26 Paſteboard uſed in the manufacture of woollen cloth.

The Britiſh and Dutch have had the greateſt ſucceſs in manufacturing paſteboard, which they make either from a ſingle maſs of ſtuff on the form, or from a collection of ſeveral ſheets paſted together. In both caſes, the ſheets of paſteboard are made of ſtuff not rotted, and triturated with rollers furniſhed with blades of well tempered ſteel. By the operation of the exchange, and ſmoothing continued for a long time, the

Different kinds of Paper.

Britiſh and Dutch obtain ſolid and ſmooth ſtuffs, which neither break under the folds of cloth nor adhere to them. The ſtuffs not putrefied have another advantage in this ſpecies of paſteboard, namely, that of reſiſting the action of heat, which they experience between the folds of cloth, without waſting or tarniſhing, and of conſequence they may be uſed for a long time.

27 Printing paper.

In England they have at leaſt equalled any other nation in the manufacture of this paper; and even in Scotland they have arrived to ſuch a degree of perfection in this art, that great part of what they manufacture is ſent into England. It requires to be made of a ſoft and equal ſtuff, without folds or wrinkles, of a natural whiteneſs, and with a ſhade of blue. It muſt be ſized leſs ſtrongly than writing paper, but ſufficiently well to give neatneſs to the characters. The paper, thus properly prepared, yields eaſily to the printing preſs, and takes a ſufficient quantity of ink. The ſtuff muſt be without greaſe, and wrought with that degree of ſlowneſs as to make it ſpread equally over the form, and take a neat and regular grain; without this the characters will not be equally marked in every part of the page; and the ſmalleſt quantity of greaſe renders the ſizing unequal and imperfect. Some artiſts with conſiderable ſucceſs, both to meliorate the grain, and to reduce the inequalities of the ſurface, have ſubmitted this paper to the exchange. And it is proper to add, that a moderate degree of exchanging and of preſſing may be of great ſervice after the ſheets are printed, to deſtroy the hollow places occaſioned by the preſs, and the relievo of the letters.

28 Paper for engraving.

Engraving requires a paper of the ſame qualities with the laſt mentioned, with reſpect to the ſtuff, which muſt be pure, without knots, and equally reduced; the grain uniform, and the ſheets without folds or wrinkles. To preſerve the grain, it is neceſſary that it be dried ſlowly in the loweſt place of the drying houſe. If it is ſubmitted to the exchange, the effects of it muſt be moderated with the greateſt care, and the action of the two firſt preſſes muſt be equally diſtributed over the whole maſs, otherwiſe the inequality of the moiſture at the middle and ſides will expoſe it to wrinkles in the drying. The ſizing of this paper muſt alſo be moderate. Theſe circumſtances are neceſſary to make it receive with neatneſs all the ſoft and delicate touches of the plate. The ſoft and yielding paper of Auvergne poſſeſſes all thoſe advantages; and accordingly a great quantity of this and of printing paper were formerly imported into Britain and Holland from France, where they ſtill continue to rot the materials from which they make engraving paper. The wire-wove frame, though but lately invented, is, we are told, peculiarly adapted to this kind of paper.

29 Paper for cards or any kind of painting on a ſmooth ſurface.

Paper for cards muſt be manufactured from a pretty firm ſtuff, in order to take that degree of ſmoothneſs which makes the cards glide eaſily over one another in uſing. For this reaſon the cardmakers reject every kind of paper which is ſoft and without ſtrength.— This paper requires to be very much ſized, ſince the ſizing holds the place of varniſh, to which the ſmoothing gives a glazed and ſhining ſurface. To anſwer all theſe purpoſes, the rags require to be a little rotted, and the mallets ſtrongly armed with iron ſtuds. At preſent Angoumois is almoſt the only province in France which ſells card paper to the Dutch and the other northern nations. The rags of Angoumois have the peculiar quality of not turning too ſoft in the putrefaction, and the mills of that province reduce them to ſtuff though they be not much putrefied. The French, we believe, excel every other nation in this branch of the manufacture of paper.

Miſcellaneous Obſervations on Paper.

Sect. III. *Miſcellaneous Obſervations on Paper.*

30 To preſerve paper from ſinking.

To hinder paper from ſinking, take about the ſize of a nut of rock alum, diſſolve it in a glaſs of clear water, and apply it to the paper, which has not been ſufficiently ſized, with a fine ſponge. It is in this manner that the paper manufacturers of Paris prepare the paper for drawing called *papiers loves*. When there is occaſion to write on a printed book, or on paper too freſh, it is ſufficient to mix a little gum with ordinary ink.

31 Paper varniſhed for writing.

To give to writing paper a brilliant varniſh, take that which is of an ordinary fineneſs, very ſmooth, without any kind of ſtain or hairs on its ſurface; ſtretch it on a ſmooth plank, and by means of a hare's foot cover it with a thin and equal layer of ſandarac finely powdered. Afterwards, if a whole ream is to be varniſhed, take eight ounces of rock alum and one ounce of white ſugarcandy; bring them to boil in ſix pints of water; and when the liquor is lukewarm, wet that ſide of the ſheet which has been covered with the ſandarac with a fine ſponge; lay the ſheets in a heap, one ſheet exactly above another; and ſubmit the ream to the preſs for the ſpace of twelve hours: hang them afterwards ſheet by ſheet on the cords of the drying houſe; put them again under the preſs for ſome days to ſtretch them; and, finally, beat them with a bookbinder's mallet. This paper can only be uſed for three or four months after it is prepared.

32 Paper prepared for drawing.

Painters prepare their paper for drawing, and give it a dark ground, which ſpares them much labour of the pencil afterwards in thoſe places where ſhade is neceſſary. For this purpoſe, they take white paper and paſs a ſponge over it, which has imbibed water impregnated with ſoot, leaving the light places to be formed afterwards. They uſe alſo a kind of paper for drawing, which is called tainted paper. A light colour is paſſed over the whole ground, which deprives the paper of its original brightneſs, and makes the light places of the print appear more in relievo, and more luminous.

33 Paper prepared for copying a print.

The method moſt common and moſt convenient for copying a print, is to uſe oiled paper. The manner of preparing this paper is to take that which is thin and ſmooth, commonly known by the name of *ſerpent paper*, and moiſten it with a compoſition, two parts of the oil of walnuts and one part of the oil of turpentine mixed well together. A ſheet of paſteboard and a ſheet of paper are laid on a ſmooth table; above them are placed two ſheets of paper to be prepared; and a layer of the oil applied to the uppermoſt is ſufficient to penetrate both. This may be done to any number of ſheets, and a ſtrong ſheet of paſteboard is placed over the whole. The heap is afterwards ſubmitted to the preſs, under which it remains for two or three days till the oil be completely dry. Paper prepared in this manner ſerves to copy very readily and exactly

Miſcellaneous Obſervations on Paper.

exactly all kinds of figures and plans; becauſe being altogether tranſparent, all the parts of the drawing, whether of light or ſhade, are eaſily diſtinguiſhed.

34 Incombuſtible paper.

Beſides the paper made from the aſbeſtos, it is neceſſary for wrapping up gunpowder and valuable writings, to have a paper that will not eaſily take fire. The manner in which this is prepared is extremely ſimple. Ordinary paper is dipped into boiling liquid, conſiſting of three-fourths of water and one-fourth of diſſolved alum. This ſalt, which is not inflammable, covers the ſurface of the paper, and renders it in ſome meaſure incombuſtible.

35 A method of eraſing ink from paper.

In the ſeaſon of verjuice, a little of it diluted with water is ſufficient for obliterating any freſh ſpot of ink. The ſalt of the verjuice diſſolved in water anſwers the purpoſe equally well, and the ſalt of the ſorrel is alſo employed, though with leſs effect. If the ſpots be dry, and the above acids are inſufficint to eradicate them, a little aquafortis diluted in water and applied with the feather of a quill or a fine hair pencil will make them entirely diſappear.

36 A method for taking oil ſtains out of paper.

Books and manuſcripts are ſometimes defaced by accidental ſtains with oil. To remove ſuch blemiſhes, burn ſheeps bones and reduce them to a fine powder; lay a quantity of this powder on each ſide of the ſtain; place it between two ſheets of white paper, and ſubmit it for twelve hours to the preſs. If the ſtains have not diſappeared, it will be neceſſary to reiterate the proceſs.

A method of making oiled paper take colours.

To make oiled papers take colours; mix with the colours a very ſmall quantity either of the gall of a pike or carp; and as theſe ſubſtances are of the nature of ſoap, they diſſolve the greaſe that is in the paper, and permit the colours to be ſpread over the ſurface.

38 To make emery paper.

Emery paper, which is employed for taking the ruſt from iron without waſting it, is made by impregnating coarſe paper with gummed water or any other tenacious ſubſtance, and then covering it over with the fineſt emery.

39 taining or olouring paper.

The colours proper for paper are not different from thoſe uſed for other ſubſtances, and are enumerated under the article *Colour-Making*. They are applied with ſoft bruſhes, after being tempered to a due degree with ſize or gum water. If the paper on which they are to be laid is ſoft, ſo that the colours are apt to go through, it muſt alſo be ſized before they are laid on, or a proportionably larger quantity muſt be uſed along with the colours themſelves. If a conſiderable extent of the paper is to be done over with one colour, it muſt receive ſeveral coatings, as thin as poſſible, letting each coat dry before another is put on, otherwiſe the colour will be unequal.

40 To gild paper.

Take yellow ochre, grind it with rain water, and lay a ground with it upon the paper all over; when dry, take the white of eggs, beat it clear with white ſugarcandy, and ſtrike it all over: then lay on the leaf-gold; and when dry, poliſh it with a tooth. Some take ſaffron, boil it in water, and diſſolve a little gum with it; then they ſtrike it over the paper, lay on the gold; and, when dry, they poliſh it.

41 To ſilver paper after the Chineſe method without ſilver.

Take two ſcruples of clear glue made of neats leather, one ſcruple of white alum, and half a pint of clear water; ſimmer the whole over a ſlow fire, till the water is conſumed, or the ſteam ceaſes: Then, your ſheets of paper being laid on a ſmooth table, you dip a pretty large pencil into that glue, and daub it over as even as you can, repeating this two or three times: then ſift the powder of talc through a fine ſieve made of horſe hair or gauze, over it; and then hang it up to dry; and, when dry, rub off the ſuperfluous talc, which ſerves again, for the ſame purpoſe. The talc you prepare in the following manner: Take fine white tranſparent Muſcovy talc; boil it in clear water for four hours; then take it off the fire, and let it ſtand ſo for two days: then take it out, waſh it well, and put it into a linen rag, and beat it to pieces with a mallet: to 10 pounds of talc add 3 pounds of white alum, and grind them together in a little hand mill; ſift it through a gauze ſieve; and being thus reduced to a powder, put it into water, and juſt boil it up: then let it ſink to the bottom, pour off the water from it, place the powder in the ſun to dry, and it will become a hard conſiſtence. This beat in a mortar to an impalpable powder, and keep it, for the uſe above mentioned, free from duſt.

42 White and coloured grounds for paper hangings.

The common grounds laid in water are made by mixing whiting with the common glovers ſize, and laying it on the paper with a proper bruſh in the moſt even manner. This is all that is required, where the ground is to be left white; and the paper being then hung on a proper frame till it be dry, is fit to be painted. When coloured grounds are required, the ſame method muſt be purſued, and the ground of whiting firſt laid; except in pale colours, ſuch as ſtraw colours or pink, where a ſecond coating may ſometimes be ſpared, by mixing ſome ſtrong colour with the whiting.

43 Method of painting the paper hangings.

There are three methods by which paper hangings are painted; the firſt by *printing* on the colours; the ſecond by uſing the *ſtencil;* and the third by laying them on with a *pencil,* as in other kinds of painting.

When the colours are laid on by printing, the impreſſion is made by wooden prints; which are cut in ſuch manner, that the figure to be expreſſed is made to project from the ſurface by cutting away all the other part; and this, being charged with the colours tempered with their proper vehicle by letting it gently down on a block on which the colour is previouſly ſpread, conveys it from thence to the ground of the paper, on which it is made to fall more forcibly by means of its weight, and the effort of the arm of the perſon who uſes the print. It is eaſy to conclude, that there muſt be as many ſeparate prints as there are colours to be printed. But where there are more than one, great care muſt be taken, after the firſt, to let the print fall exactly in the ſame part of the paper as that which went before; otherwiſe the figure of the deſign would be brought into irregularity and confuſion. In common paper of low price, it is uſual, therefore, to print only the outlines, and lay on the reſt of the colours by ſtencilling; which both ſaves the expence of cutting more prints, and can be practiſed by common workmen, not requiring the great care and dexterity neceſſary to the uſing ſeveral prints.

The manner of *ſtencilling* the colours is this. The figure, which all the parts of any particular colour make in the deſign to be painted, is to be cut out, in a piece of thin leather or oil cloth, which pieces of leather or oil cloth are called *ſtencils;* and being laid flat on the ſheets of paper to be printed, ſpread on a table or floor, are to be rubbed over with the colour, properly tempered, by means of a large bruſh. The colour paſſing over the whole is conſequently ſpread on thoſe parts of the paper where the cloth or leather is cut away, and give the ſame effect as if laid on by a print. This is nevertheleſs only practicable in parts where there are only detached maſſes or ſpots of colours: for where there are ſmall continued lines, or parts that run one into another, it is difficult to preſerve the connexion or continuity of the parts of the cloth, or to keep the ſmaller corners cloſe down to the paper; and therefore, in ſuch caſes, prints are preferable. Stencilling is indeed a cheaper method of ridding coarſe work than printing: but without ſuch extraordinary attention and trouble as render it equally difficult with printing, it is far leſs beautiful and exact in the effect. For the outline of the ſpots of colour want that ſharpneſs and regularity that are given by prints, beſides the frequent extralineations, or deviations from the juſt figure, which happens by the original miſplacing of the ſtencils, or the ſhifting the place of them during the operation.

Pencilling is only uſed in the caſe of nicer work, ſuch as the better imitations of the India paper. It is performed in the ſame manner as other paintings in water or varniſh. It is ſometimes uſed only to fill the outlines already formed by printing, where the price of the colour, or the exactneſs of the manner in which it is required to be laid on, render the ſtencilling or printing it leſs proper; at other times, it is uſed for forming or delineating ſome parts of the deſign, where a ſpirit of freedom and variety, not to be had in printed outlines, is deſired to be had in the work.

44 Management of the flock paper.

The paper deſigned for receiving the flock is firſt prepared with a varniſh-ground with ſome proper colour, or by that of the paper itſelf. It is frequently practiſed to print ſome Moſaic, or other ſmall running figure in colours, on the ground, before the flock be laid on; and it may be done with any pigment of the colour deſired, tempered with varniſh, and laid on by a print cut correſpondently to that end.

The method of laying on the flock is this. A wooden print being cut, as is above deſcribed, for laying on the colour in ſuch manner that the part of the deſign which is intended for the flock may project beyond the reſt of the ſurface, the varniſh is put on a block covered with leather or oil-cloth, and the print is to be uſed alſo in the ſame manner, to lay the varniſh on all the parts where the flocks are to be fixed. The ſheet, thus prepared by the varniſhed impreſſion, is then to be removed to another block or table, and to be ſtrewed over with flock; which is afterwards to be gently compreſſed by a board, or ſome other flat body, to make the varniſh take the better hold of it: and then the ſheet is to be hung on a frame till the varniſh be perfectly dry; at which time the ſuperfluous part of flock is to be bruſhed off by a ſoft camel's hair bruſh; and the proper flock will be found to adhere in a very ſtrong manner.

The method of preparing the flock is, by cutting woollen rags or pieces of cloth with the hand, by means of a large bill or chopping knife; or by means of a machine worked by a horſe mill.

There is a kind of counterfeit flock paper, which, when well managed, has very much the ſame effect to the eye as the real, though done with leſs expence. The manner of making this ſort is, by laying a ground of varniſh on the paper; and having afterwards printed the deſign of the flock in varniſh, in the ſame manner as for the true; inſtead of the flock, ſome pigment, or dry colour, of the ſame hue with the flock required by the deſign, but ſomewhat of a darker ſhade, being well powdered, is ſtrewed on the printed varniſh, and produces nearly the ſame appearance.

Paper Money.

PAPER *Money* is a term frequently made uſe of for bank bills, which paſs currently in trade inſtead of gold and ſilver.

Concerning this ſpecies of currency, the national utility of which has been controverted by ſome, we have the following obſervations in Dr Smith's Treatiſe on the Wealth of Nations: "The ſubſtitution of paper in the room of gold and ſilver money replaces a very expenſive inſtrument of commerce with one much leſs coſtly, and ſometimes equally convenient. Circulation comes to be carried on by a new wheel, which it coſts leſs both to erect and maintain than the old one.

"When the people of any particular country have ſuch confidence in the fortune, probity, and prudence of a particular banker, as to believe that he is always ready to pay upon demand ſuch of his promiſſory notes as are likely at any time to be preſented to him, thoſe notes come to have the ſame currency as gold and ſilver money, from the confidence that ſuch money can at any time be had for them.

"A particular banker lends among his cuſtomers his own promiſſory notes, to the amount, we ſhall ſuppoſe, of 100,000l. As thoſe notes ſerve all the purpoſes of money, his debtors pay him the ſame intereſt as if he had lent them ſo much money. This intereſt is the ſource of his gain. Though ſome of thoſe notes are continually coming back upon him for payment, part of them continue to circulate for months and years together. Though he has generally in circulation, therefore, notes to the amount of 100,000l. 20,000l. in gold and ſilver may frequently be a ſufficient proviſion for anſwering occaſional demands. By this operation, therefore, 20,000l. in gold and ſilver perform all the functions which 100,000l. could otherwiſe have performed. Eighty thouſand pounds of gold and ſilver can therefore, in this manner, be ſpared from the circulation of the country; and if different operations of the ſame kind ſhould at the ſame time be carried on by many different banks and bankers, the whole circulation may be thus conducted with a fifth part only of the gold and ſilver.

"Let us, ſuppoſe, for example, that the whole circulating money of ſome particular country amounted, at a particular time, to 1,000,000l. ſterling, that ſum being then ſufficient for circulating the whole annual produce of their land and labour. Let us ſuppoſe too, that, ſome time thereafter, different banks and bankers iſſued promiſſory notes, payable to the bearer, to the extent of 1,000,000l. reſerving in their different coffers 200,000l. for anſwering occaſional demands. There would remain, therefore, in circulation 800,000l. in gold and ſilver, and 1,000,000l. of bank notes, or 1,800,000l. of paper and money together. But the annual produce of the land and labour of the country had before required only 1,000,000l. to circulate and diſtribute it to its proper conſumers, and that annual produce cannot be immediately augmented by thoſe operations of banking. One million, therefore, will be ſufficient to circulate it after them. The goods to be bought and ſold being preciſely the ſame as before, the ſame quantity of money will be ſufficient for buying and ſelling them. The channel of circulation, if I may be allowed ſuch an expreſſion, will remain preciſely the ſame as before. One million we have ſuppoſed ſufficient to fill that channel. Whatever, therefore, is poured into it beyond this ſum, cannot run in it, but muſt overflow. One million eight hundred thouſand pounds are poured into it. Eight hundred thouſand pounds, therefore, muſt overflow, that ſum being over and above what can be employed in the circulation of the country. But though this ſum cannot be employed at home, it is too valuable to be allowed to lie idle. It will therefore be ſent abroad, in order to ſeek that profitable employment which it cannot find at home. But the paper cannot go abroad; becauſe, at a diſtance from the banks, which iſſue it, and from the country in which payment of it can be exacted by law, it will not be received in common payments. Gold and ſilver, therefore, to the amount of 800,000l. will be ſent abroad, and the channel of home circulation ſtill remain filled with 1,000,000l. of paper inſtead of 1,000,000l. of thoſe metals which filled it before.

" But though ſo great a quantity of gold and ſilver is thus ſent abroad, we muſt not imagine that it is ſent abroad for nothing, or that its proprietors make a preſent of it to foreign nations. They will exchange it for foreign goods of ſome kind or another, in order to ſupply the conſumption either of ſome other foreign country or of their own.

" If they employ it in purchaſing goods in one foreign country in order to ſupply the conſumption of another, or in what is called the *carrying trade*, whatever profit they make will be an addition to the neat revenue of their own country. It is like a new fund, created for carrying on a new trade; domeſtic buſineſs being now tranſacted by paper, and the gold and ſilver being converted into a fund for this new trade.

" If they employ it in purchaſing foreign goods for home conſumption, they may either firſt purchaſe ſuch goods as are likely to be conſumed by idle people who produce nothing, ſuch as foreign wines, foreign ſilks, &c.; or, ſecondly, they may purchaſe an additional ſtock of materials, tools, and proviſions, in order to employ an additional number of induſtrious people, who reproduce, with a profit, the value of their annual conſumption.

" So far as it is employed in the firſt way, it promotes prodigality, increaſes expence and conſumption, without increaſing production, or eſtabliſhing any permanent fund for ſupporting that expence, and is in every reſpect hurtful to the ſociety.

" So far as it is employed in the ſecond way, it promotes induſtry; and though it increaſes the conſumption of the ſociety, it provides a permanent fund for ſupporting that conſumption, the people who conſume, reproducing, with a profit, the whole value of their annual conſumption. The groſs revenue of the ſociety, the annual produce of their land and labour, is increaſed by the whole value which the labour of thoſe workmen adds to the materials upon which they are employed; and their neat revenue by what remains of this value, after deducting what is neceſſary for ſupporting the tools and inſtruments of their trade.

" That the greater part of the gold and ſilver which, being forced abroad by thoſe operations of banking, is employed in purchaſing foreign goods for home conſumption, is and muſt be employed for purchaſing thoſe of this ſecond kind, ſeems not only probable, but almoſt unavoidable. Though ſome particular men may ſometimes increaſe their expence very conſiderably, though their revenue does not increaſe at all, we may be aſſured that no claſs or order of men ever does ſo; becauſe, though the principles of common prudence do not always govern the conduct of every individual, they always influence that of the majority of every claſs or order. But the revenue of idle people, conſidered as a claſs or order, cannot in the ſmalleſt degree be increaſed by thoſe operations of banking. Their expence in general, therefore, cannot be much increaſed by them, though that of a few individuals among them may, and in reality ſometimes is. The demand of idle people, therefore, for foreign goods, being the ſame, or very nearly the ſame, as before, a very ſmall part of the money, which being forced abroad by thoſe operations of banking, is employed in purchaſing foreign goods for home conſumption, is likely to be employed in purchaſing thoſe for their uſe. The greater part of it will naturally be deſtined for the employment of induſtry, and not for the maintenance of idleneſs.

" When we compute the quantity of induſtry which the circulating capital of any ſociety can employ, we muſt always have regard to thoſe parts of it only which conſiſt in proviſions, materials, and finiſhed work: the other, which conſiſts in money, and which ſerves only to circulate thoſe three, muſt always be deducted. In order to put induſtry into motion, three things are requiſite; materials to work upon, tools to work with, and the wages or recompenſe for the ſake of which the work is done. Money is neither a material to work upon, nor a tool to work with; and though the wages of the workman are commonly paid to him in money, his real revenue, like that of all other men, conſiſts, not in the money, but in the money's worth; not in the metal pieces, but in what can be got for them.

" The quantity of induſtry which any capital can employ, muſt evidently be equal to the number of workmen whom it can ſupply with materials, tools, and a maintenance ſuitable to the nature of the work. Money may be requiſite for purchaſing the materials and tools of the work, as well as the maintenance of the workmen. But the quantity of induſtry which the whole capital can employ, is certainly not equal both to the money which purchaſes, and to the materials, tools, and maintenance, which are purchaſed with it; but only to one or other of thoſe two values, and to the latter more properly than to the former.

"When paper is ſubſtituted in the room of gold and ſilver money, the quantity of the materials, tools, and maintenance, which the whole circulating capital can ſupply, may be increaſed by the whole value of gold and ſilver which uſed to be employed in purchaſing them. The whole value of the great wheel of circulation and diſtribution is added to the goods which are circulated and diſtributed by means of it. The operation, in ſome meaſure, reſembles that of the undertaker of ſome great work, who, in conſequence of ſome improvement in mechanics, takes down his old machinery, and adds the difference between its price and that of the new to his circulating capital, to the fund from which he furniſhes materials and wages to his workmen.

"What the proportion is which the circulating money of any country bears to the whole value of the annual produce circulated by means of it, it is perhaps impoſſible to determine. It has been computed by different authors at a fifth, at a tenth, at a twentieth, and at a thirtieth part of that value. But how ſmall ſoever the proportion which the circulating money may bear to the whole value of the annual produce, as but a part, and frequently but a ſmall part, of that produce, is ever deſtined for the maintenance of induſtry, it muſt always bear a very conſiderable proportion to that part. When, therefore, by the ſubſtitution of paper, the gold and ſilver neceſſary for circulation is reduced to perhaps a fifth part of the former quantity, if the value of only the greater part of the other four fifths be added to the funds which are deſtined for the maintenance of induſtry, it muſt make a very conſiderable addition to the quantity of that induſtry, and conſequently to the value of the annual produce of land and labour.

"That part of his capital which a dealer is obliged to keep by him unemployed, for anſwering occaſional demands, is ſo much dead ſtock, producing nothing either to him or to his country. The judicious operations of banking enable him to make it active and productive. The gold and ſilver money which circulates in any country, and by means of which the produce of its land and labour is annually circulated and diſtributed to the proper conſumers, is, in the ſame manner as the ready money of the dealer, all dead ſtock. It is a very valuable part of the capital of the country, which produces nothing to the country. The judicious operations of banking, by ſubſtituting paper in the room of a great part of it, enables the country to make a great part of this dead ſtock active and productive. The gold and ſilver money which circulates in any country, may very properly be compared to a highway, which, while it circulates and carries to market all the graſs and corn of the country, produces itſelf not a ſingle pile of either. The judicious operations of banking, by providing, If I may be allowed ſo violent a metaphor, a ſort of waggon way through the air, enable the country to convert, as it were, a great part of its highways into good paſtures and corn fields, and thereby to increaſe very conſiderably the annual produce of its land and labour. The commerce and induſtry of the country, however, it muſt be acknowledged, though they may be ſomewhat augmented, cannot be altogether ſo ſecure, when they are thus, as it were, ſuſpended upon the Dædalian wings of paper money, as when they travel about upon the ſolid ground of gold and ſilver.

"The whole paper money of every kind which can eaſily circulate in any country, never can exceed the value of the gold and ſilver, of which it ſupplies the place, or which (the commerce being ſuppoſed the ſame) would circulate there if there was no paper money. If twenty ſhilling notes, for example, are the loweſt paper money current in Scotland, the whole of that currency, which can eaſily circulate there, cannot exceed the ſum of gold and ſilver which would be neceſſary for tranſacting the annual exchanges of twenty ſhillings value and upwards, uſually tranſacted within that country. Should the circulating paper at any time exceed that ſum, as the exceſs could neither be ſent abroad, nor be employed in the circulation of the country, it muſt immediately return upon the banks to be exchanged for gold and ſilver. Many people would immediately perceive that they had more of this paper than was neceſſary for tranſacting their buſineſs at home, and as they could not ſend it abroad, they would immediately demand payment of it from the banks. When this ſuperfluous paper was converted into gold and ſilver, they could eaſily find a uſe for it by ſending it abroad; but they could find none while it remained in the ſhape of paper. There would immediately, therefore, be a run upon the banks to the whole extent of this ſuperfluous paper, and if they ſhowed any difficulty or backwardneſs in payment, to a much greater extent; the alarm which this would occaſion neceſſarily increaſing the run." See BANK and TRADE.

PAPER Office, an office in the palace of Whitehall, in which all the public writings, matters of ſtate and council, proclamations, letters, intelligences, negotiations abroad, and generally all deſpatches that paſs through the offices of the ſecretaries of ſtate, are lodged, by way of library.

PAPIER MACHE. This is a ſubſtance made of cuttings of white or brown paper, boiled in water, and beaten in a mortar, till they are reduced into a kind of paſte, and then boiled with a ſolution of gum arabic or of ſize, to give tenacity to the paſte, which is afterwards formed into different toys, &c. by preſſing it into oiled moulds. When dry, it is done over with a mixture of ſize and lamp black, and afterwards varniſhed. The black varniſh for theſe toys, according to Dr Lewis, is prepared as follows: ſome colophony, or turpentine boiled down till it becomes black and friable, is melted in a glazed earthen veſſel, and thrice as much amber in fine powder ſprinkled in by degrees, with the addition of a little ſpirit or oil of turpentine now and then: when the amber is melted, ſprinkle in the ſame quantity of ſarcocolla, continuing to ſtir them, and to add more ſpirit of turpentine, till the whole becomes fluid; then ſtrain out the clear through a coarſe hair bag, preſſing it gently between hot boards. This varniſh, mixed with ivory black in fine powder, is applied, in a hot room, on the dried paper paſte; which is then ſet in a gently heated oven, next day in a hotter oven, and the third day in a very hot one, and let ſtand each time till the oven grows cold. The paſte thus varniſhed is hard, durable, gloſſy, and bears liquors hot or cold.

PAPHLAGONIA (anc. geog, a country of the Hither Aſia, beginning at Parthenius, a river of Bithynia, on the weſt, and extending in length to the Halys eaſtward, with the Euxine to the north, and Galatia to the ſouth. Pliny enlarges the limits on the weſt ſide to the river Billis, on this ſide the Pathenius. It is called *Pylæmenia* by ſome (Pliny). *Paphlagones*, the people, mentioned by Homer, and therefore of no ſmall antiquity. A ſuperſtitious and ſilly people (Lucian); a brave people (Homer); taking their name from Phaleg (Bocchart).

PAPHOS (anc. geog.), two adjoining iſlands on the weſt ſide of the iſland of Cyprus; the one called *Palæ Paphos* (Strabo, Ptolemy, Pliny); the other *Nea Paphos;* and when mentioned without an adjunct, this latter is always underſtood. Both dedicated to Venus, and left undiſtinguiſhed by the poets (Virgil, Horace). Hence Venus is ſurnamed *Paphia. Paphii*, the people, (Coins, Stephanus). It was reſtored by Auguſtus, after a ſhock of an earthquake, and called *Auguſta* (Dio).

The Abbé Mariti, in his Travels through Cyprus, gives the following account of the iſland of Paphos. "It is ſituated (ſays he) on the ſouthern ſide: it contained the celebrated temple of Venus; which, together with the city, was deſtroyed by an earthquake, ſo that the leaſt veſtige of it is not now to be ſeen. A lake in the neighbourhood, which even in ſummer overflows with ſtagnant and corrupted water, renders the air in ſome degree unwholeſome. On the weſtern coaſt is the new Paphos, called by ſome of the modern geographers *Baſſos;* a name which is unknown in the iſland of Cyprus. That we may not poſitively aſcribe to the latter every thing that hiſtory tells us of Paphos in general, it may not be here improper to mention that it has been ſeveral times deſtroyed. This city had a port, where veſſels trading upon that coaſt ſtill caſt anchor: but this happens only in ſummer; for, being expoſed to every wind, it is extremely dangerous. The bottom of it is full of ſharp rocks; which ſometimes deſtroy the cables ſo much, that mariners are obliged to keep them afloat on the ſurface of the water, by means of empty caſks fixed to them at certain diſtances. In the neighbourhood there are two caſtles; one on the borders of the ſea, and the other on the ſummit of a little hill: but the latter is at preſent in ruins. The government of Paphos conſiſts of a digdaban or commiſſary; a cadi; and an aga, who preſides over the cuſtomhouſe Of all the Chriſtian edifices, there is none remaining but the church of St George, in which ſervice is performed by the Greek miniſters. The productions of this part of the iſland, which are all of an excellent quality, are ſilk, barley, and other kinds of grain. To diſcover the origin of the Old and New Paphos, would be carrying light into the midſt of the thickeſt darkneſs. When we have added conjecture to conjecture, we are ſtill in the ſame ſituation. As this is an attempt ſuperior to my abilities, I ſhall leave it to the divining, though uncertain, knowledge of our antiquaries. I muſt, however, obſerve, that there was here formerly a temple dedicated to Venus, which was entirely deſtroyed by an earthquake. In this iſland St Paul by his eloquence converted Sergius, a Roman proconſul. He here likewiſe conferred the deaconſhip on his diſciple and colleague Titus, who ſoon after ſuffered martyrdom. Paphos was an epiſcopal city in the time of the Luſignans; and it is ſtill the ſeat of a biſhop, who is a ſuffragan to the archbiſhop of Nicoſia. On the weſtern ſide of the iſland there are a great number of ſcattered villages; but they are not worthy of notice, being either abandoned or in ruins."

Mr Bruce informs us, that in the neighbourhood of this place many ſilver medals of excellent workmanſhip are dug up; they are, however, but of little eſtimation among the antiquarians, being chiefly of towns of the ſize of thoſe found at Crete and Rhodes, and in all the iſlands of the Archipelago. There are ſome excellent Greek intaglios; generally upon better ſtones than uſual in the iſlands. This illuſtrious traveller informs us, that he has ſeen ſome heads of Jupiter, remarkable for buſhy hair and a beard, which were of excellent workmanſhip, and worthy of any price. All the inhabitants of the iſland are ſubject to fevers, but eſpecially thoſe in the neighbourhood of Paphos. The ſame traveller obſerves, that Cyprus was very long undiſcovered; for though ſhips had been ſailing on the Mediterranean 1700 years before Chriſt, and though the iſland is only a day's ſailing from the continent of Aſia on the north and eaſt, and little more from that of Africa on the ſouth, it was not known at the building of Tyre, a little before the Trojan war, that is, 500 years after the neighbouring ſeas had been navigated. It was covered with wood at its firſt diſcovery; and our author is of opinion, that it was not well known even at the time of building of Solomon's temple; becauſe we do not find that Hiram king of Tyre, though juſt in its neighbourhood, ever had recourſe to it for wood: though the carriage would undoubtedly have been eaſier from thence, than to have brought it down from the top of Mount Lebanon. Eratoſthenes informs us, that in ancient times the iſland was ſo overgrown with wood, that it could not be tilled; ſo that they firſt cut down the timber to be uſed in the furnaces for melting ſilver and copper; that after this they built fleets with it: but finding even this inſufficient, they gave liberty to all ſtrangers to cut it down for whatever purpoſe they pleaſed; and not only ſo, but they gave them afterwards the property of the ground they had cleared. Matters are now quite altered; and the want of wood is a principal complaint in moſt parts of the iſland. About Acamas, however, on the weſt ſide of the iſland, the wood is ſtill thick and impervious, inhabited by large ſtags and wild boars of a monſtrous ſize. Mr Bruce was informed, that a live elephant had lately been ſeen there, but gave no credit to the account.

PAPIAS, biſhop of Hieropolis, a city of Phrygia, was the diſciple of St John the Evangeliſt, and the companion of Polycarp, as St Jerome obſerves, and not of John the Ancient, as ſome other authors have maintained. He compoſed a work in five books, entitled *Expoſitions of the Diſcourſes of our Lord*, of which there are only ſome fragments now remaining. He it was who introduced the opinion of the Millenarians.

PAPILIO, the Butterfly, in zoology; a genus of inſects belonging to the order of lepidoptera. It has four wings, imbricated with kind of downy ſcales; the tongue is convoluted ſpiral form; and the body is hairy. The antennæ grow thicker towards their extremity, and are in moſt ſubjects terminated by a kind of capitulum or head. The wings when ſitting, are erect, inſomuch that their extremities meet or touch one another above the body. They fly in the day time. There are 273 ſpecies, principally diſtinguiſhed by the colour of their wings. Mr Barbut has divided them into four ſections, which he thus characterizes. 1. The equites, or riders, the upper wings being longer from the hindermoſt angle to the point than to the baſe; their antennæ are often filiform. They are divided into Trojans; which for the moſt part are black, with bloodlike ſpots on the breaſt; and Greeks, whoſe breaſts have no ſuch marks; the ſmall eye being placed at the angle of the anus; and of theſe ſome are without bands or fillets, others with bands or fillets. 2. The heliconians, whoſe wings are narrow throughout, often bare; the upper oblong, the under ones very ſhort. 3. The Danai, whoſe wings are entire; the candidi, with whitiſh wings; the feſtivi, with variegated wings. 4. The nymphals, whoſe wings are denticulated: divided into the gemmati whoſe wings have eyes; ſubdivided into thoſe who have eyes on all the wings; thoſe which have them on the upper wings; thoſe which have them on the under ones; and the phalerati, whoſe wnigs are without eyes. 5. The plebeians, whoſe larva is often contracted; divided into the rurales, with darkiſh ſpots on their wings; and the urbicolæ, with ſpots generally tranſparent on their wings.

Barbut on Inſects.

The beauties of this elegant part of the creation are well known; and there are few who can contemplate them without aſtoniſhment. We have the following account of their various ſtages of exiſtence in Barbut†. "The caterpillar (ſays he) informs us in what manner it prepares for the lethargic ſleep, which is to ſerve as a tranſition to its metamorphoſis. The period of its reptile life being accompliſhed, it changes its form to become an inhabitant of the air. The chryſalis is at once the tomb of the caterpillar and the cradle of the butterfly. It is within a ſilken cod, or under a tranſparent veil, that this great miracle of nature is daily wrought; but how does the weak defenceleſs butterfly ſcarce unfolded into exiſtence, go about to make its way through the impenetrable walls that preſerved it from inſult during its torpid ſtate? How will it bear the effulgence of the light, and keenneſs of the air? Take one of their cods, make an aperture in it with a pair of ſciſſars, fix it againſt a glaſs; obſerve the inſect, you will perceive the organs gradually diſplaying themſelves: follow his operation with your eye; he ſtruggles to break looſe from his confinement. Obſerve the frothy liquor that it diſgorges; that liquor tends to ſoften the end of the cod, which at length yields to the butting of the inſect's head. By degrees the bar is removed, and the butterfly ſprings forth; the impreſſion of the air acts upon its wings, ſlightly apparent at firſt, but which afterwards expand with remarkable rapidity. The diſplay of them is ſometimes checked by drought, in which caſe the inſect is deprived of the faculty of flying. The roſtrum, extended under the covering of the chryſalis is in this laſt ſtate rolled up into a ſpiral, and lodged in a receſs prepared for it. The fly is now perfectly formed; it gently flutters, then takes its flight, and purſues its mazy wanderings over the enamelled meads, plunging its roſtrum into the cups of nectareous flowers."

† *Ibid.*

Of papilio, N° 1. Barbut gives the following account. "The ground colour of the inſect is a beautiful gloſſy black, the ſuperior wings are ornamented with white forked clouds; the inferior ones are adorned with ſpots of a blood colour, thoſe neareſt the xtremities being of a lunular form, and are indented, terminating in an extended tail, and are edged with white. The apex, or crown of the head, is tipt with the ſame red colour which encircles the ſhoulders, and terminates the abdomen the ſpace of about five rings."

Plate CCCLXXIV.

Of N° 2. he ſpeaks thus: "The form of the wings reſembles the preceding inſects. They are beautifully variegated with black and yellow; the inferior ones terminate in a tail, and according to the character of the ſection are adorned with an eye of a yellowiſh red colour, encircled with blue, which is ſituated at the edge, neareſt the extremity of the abdomen. This is the largeſt, and one of the moſt beautiful inſects England produces. The caterpillar is large and ſmooth, of a bright green colour, with tranſverſal bands, of a deep gloſſy purple upon every ring, which bands are enriched with yellow ſpots; it feeds on wild fennel and other umbelliferous plants; changes to the chryſalis in July, aſſumes the winged ſtate in Auguſt, and frequents meadows. It ſometimes appears in May."

And of N° 3. we have this account: "The peacock, or peacock's eye, is eaſily known by the peacock's eyes which it bears above, four in number, one upon each wing which hath given it the name it has. Its wings, very angulous, are black underneath; above they are of a reddiſh dun colour. The upper ones have on their ſuperior edge two black oblong ſpots, with a yellow one between the two. At their extremity is found the eye, large, reddiſh in the middle, ſurrounded with a yellow circle accompanied by a ſmall portion of blue towards the exterior ſide. On that ſame ſide following the direction of the margin, there are five or ſix white ſpots, ſet in order. The inferior wings are browner, and have each a large eye of a very dark blue in the middle, ſurrounded by an aſh-coloured circle. The caterpillar of this butterfly is of a deep black, dotted with a little white."

We cannot conclude this article without noticing ſome very ſingular ſpecies; of which Mr Reaumur has given an account, and which deſerve particular regard.

One ſpecies of theſe he has called the *bundle of dry leaves*. This, when it is in a ſtate of reſt, has wholly the appearance of a little cluſter of the decayed leaves of ſome herb. The poſition and colour of its wings greatly favour this reſemblance, and they have very large ribs; wholly like thoſe of the leaves of plants, and are indented in the ſame manner at their edges as the leaves of many plants are. This ſeems to point out the care of nature for the animal, and frequently may preſerve it from birds, &c.

The ſkull butterfly is another ſingular ſpecies, ſo called from its head reſembling in ſome degree a death's head or human ſkull. This very remarkable appearance is terrible to many people; but it has another yet greater ſingularity attending it, which is, that, when frighted, it has a mournful and harſh voice. This appeared the more ſurpriſing to Mr Reaumur, as no other known butterfly had the leaſt voice at all; and he was not ready of belief that it was a real voice, but ſuſpected the noiſe, like that of the cicadæ, to be owing to the attrition of ſome part of the body; and, in fine, he, by great pains, diſcovered that this noiſe was not truly vocal, but was made by a hard and briſk rubbing of the trunk againſt two other hard bodies between which it is placed.

Another butterfly there is, ſo ſmall that it might be miſtaken for a ſmall fly. This is certainly the extreme in degree of ſize of all the known butterflies, and cannot but have been proportionably ſmall in the ſtate of a caterpillar and chryſalis: this creature ſpends its whole life in all the three ſtages of caterpillar, chryſalis, and butterfly, on the leaf of the celandine. It lives on the under ſide of the leaf; and though in the caterpillar ſtate it feeds on it, yet it does no damage. It does not eat the ſubſtance of the leaf, but draws from it only a fine juice, which is ſoon repaired again, without occaſioning any change in the appearance of the leaf. This ſpecies is very ſhort lived; and paſſes through its three ſtates in ſo ſhort a time, that there are frequently ten generations of it in one year; whereas, in all the other butterflies, two generations in the year are all that are to be had. Theſe two generations are ſufficient to make a prodigious increaſe: in a large garden, if there are twenty caterpillars in ſpring, theſe may be overlooked, and there may be eaſily concluded to be none there, even on a narrow ſearch; but if theſe twenty caterpillars afterwards become twenty butterflies, ten of which are male and ten female, and each female lay the ſame number of eggs that the common ſilk worm does, that is, four hundred; if all the caterpillars hatched of theſe become butterflies, and theſe lay eggs in the ſame proportion, which remain the winter, and come to be hatched in the ſucceeding ſpring; then from theſe twenty, in only one year, you will have eight hundred thouſand; and if we add to this the increaſe of theſe in a ſucceeding year, the account muſt appear terrible, and ſuch as no art could guard againſt. The great Ruler of the world has put ſo many hinderances in the way of this over abundant production, that it is very rare ſuch years of deſtruction happen. Some ſuch have happened, however; and much miſchief has been dreaded from them, not only from their eating all the herbage, but from themſelves being eaten with herbs in ſallads and otherwiſe: but experiments have proven this to be an erroneous opinion, and they are found to be innocent, and eatable as ſnails or oyſters.

PAPILIONACEOUS, among botaniſts, an appellation given to the flowers of plants belonging to various claſſes, from their reſembling the wings of a butterfly.

PAPINIAN, a celebrated Roman lawyer of the third century, under the emperor Severus; who had ſo high an opinion of his worth, that he recommended his ſons Caracalla and Geta to his care. Caracalla having firſt murdered his brother, ordered Papinian to compoſe a diſcourſe to excuſe this murder to the ſenate and people; which when he refuſed to undertake, the brutal emperor ordered him to be beheaded; and his body was dragged through the ſtreets of Rome. Papinian wrote ſeveral treatiſes in the line of his profeſſion.

PAPISTS, are thoſe who believe the pope or biſhop of Rome to be the ſupreme paſtor of the univerſal church, who profeſs to believe all the articles of Pope Pius's creed, and who promiſe implicit obedience to the edicts of the church, eſpecially the decrees of the council of Trent. See Pope and Trent.

PAPPENHEIM, a town of Germany, in the circle of Franconia, and capital of a county of the ſame name, with a caſtle, where the counts reſide. It is ſeated near the river Altmal, 17 miles north-weſt of Neuburg, and 32 ſouth of Nuremburg; and is ſubject to its own count. E. Long. 10. 51. N. Lat. 48. 58. The count of Pappenheim is hereditary marſhal of the empire, and performs his office at the coronation of the emperor.

PAPPUS, an eminent philoſopher of Alexandria, ſaid by Suidas to have flouriſhed under the emperor Theodoſius the Great, who reigned from A. D. 379 to 395. His writings ſhow him to have been a conſummate mathematician: Many of them are loſt; the reſt continued long in manuſcript, detached parts having only been occaſionally publiſhed in the laſt century, until Carolus Manoleſſius publiſhed his remains entire at Bologna in 1660, in folio.

Pappus, in botany, a ſoft downy ſubſtance that grows on the ſeeds of certain plants, as thiſtles, hawkweed, &c. ſerving to ſcatter and buoy them up in the air.

PAPYRUS, the famous reed from which was made the far-famed paper of Egypt. Before entering on the deſcription of the papyrus, it is natural to ſay a word or two on the opinion generally received in Europe concerning the loſs of this plant. Suppoſing this loſs poſſible, the date of it muſt be fixed at no diſtant period; for it is not 200 years ſince Guillandin and Proſper Alpin obſerved the papyrus on the banks of the Nile. Guillandin ſaw the inhabitants of the country eating the inferior and ſucculent part of the ſtem in the manner of the ancients; a fact which alone ſhows it to be the papyrus, and of which other travellers ſeem not to have availed themſelves. This practice, together with thoſe related by Proſper Alpin, are ſufficient to convince us, that this plant is not wholly uſeleſs, although it is not now employed in the fabrication of paper. The alteration on the ſoil of Egypt, and on the methods of agriculture, have in all probability rendered this plant leſs common; but cauſes altogether local could not occaſion the deſtruction of the papyrus, eſpecially as its reſidence in the marſhes would prevent their operation. But it is needleſs to reaſon from probabilities or analogy: Mr Bruce not only ſaw the papyrus growing both in Egypt and Abyſſinia, but actually made paper of it, in the manner in which it was made by the ancients. He tells us likewiſe, that, ſo far from any part of it being uſeleſs, the whole plant is at this day uſed in Abyſſinia for making boats, a piece of the acacia-tree being put in the bottom to ſerve as a keel. That ſuch were the boats of ancient Egypt, we know from the teſtimony of Pliny, who informs us, that the plants were firſt ſewed together, and then gathered up at ſtem and ſtern, and tied faſt to the keel: "Conſeritur bibula Memphitis cymba papyro."

"The bottom, root, or woody part of this plant was likewiſe of ſeveral uſes before it turned abſolutely hard; it was chewed in the manner of liquorice, having a conſiderable quantity of ſweet juice in it. This we learn from Dioſcorides; it was, I ſuppoſe, chewed, and the ſweetneſs ſucked out in the ſame manner as is done with ſugar cane. This is ſtill practiſed in Abyſſinia, where they likewiſe chew the root of the Indian corn, and of every kind of cyperus: and Herodotus tells us, that about a cubit of the lower part of the ſtalk was cut off, and roaſted over the fire, and eaten.

Appendix to Bruce's Travels.

"From the ſcarcity of wood, which was very great in Egypt, this lower part was likewiſe uſed in making cups, moulds, and other neceſſary utenſils: we need not doubt, too, one uſe of the woody part of this plant was, to ſerve for what we call *boards* or *covers* for binding the leaves, which were made of the bark; we know that this was anciently one uſe of it, both from Alcæus and Anacreon."

The papyrus, ſays Pliny, grows in the marſhes of Egypt, or in the ſtagnant places of the Nile, made by the flowing of that river, provided they are not beyond the depth of two cubits. Its roots are tortuous, and in thickneſs about four or five inches: its ſtem is triangular, riſing to the height of ten cubits. Proſper Alpin gives it about ſix or ſeven cubits above the water; the ſtem tapers from the bottom, and terminates in a point. Theophraſtus adds, that the papyrus carries a top or plume of ſmall hairs, which is the thyrſus of Pliny. Guillandin informs us, that its roots throw to the right and left a great number of ſmall fibres, which ſupport the plant againſt the violence of the wind, and againſt the waters of the Nile. According to him, the leaves of the plant are obtuſe, and like the typha of the marſhes. Mr Bruce, on the other hand, aſſures us, that it never could have exiſted in the Nile. "Its head (ſays he) is too heavy; and in a plain country the wind muſt have had too violent a hold of it. The ſtalk is ſmall and feeble, and withal too tall; the root too ſhort and ſlender to ſtay it againſt the violent preſſure of the wind and current; therefore I do conſtantly believe it never could be a plant growing in the river Nile itſelf, or in any very deep or rapid river;" but in the caliſhes or places where the Nile had overflowed and was ſtagnant.

The Egyptians made of this plant paper fit for writing (ſee Paper), which they call βιβλος or *philuria*, and alſo χαρτης, and hence the Latin *charta*; for in general the word *charta* is uſed for the paper of Egypt.

The papyrus was produced in ſo great quantities on the banks of the Nile, that Caſſiodorus (lib. xi. 38.) compares it to a foreſt. There, ſays he, riſes to the view, this foreſt without branches, this thicket without leaves, this harveſt of the waters, this ornament of the marſhes. Proſper Alpin is the firſt who gives us a plate of the papyrus, which the Egyptians call *berdi*. However badly this may be executed, it correſponds in ſome degree with the deſcription of the plant mentioned by Theophraſtus; but by much the beſt drawing of it has been given by Mr Bruce, who has very obligingly permitted us to give a copy of it. See Plate CCCLXXV.

The ancient botaniſts placed the papyrus among the graminous plants or dog graſs; ignorant of the particular kind to which it belonged, they were contented to ſpecify it under the name of *papyrus*, of which there were two kinds, that of Egypt, and that of Sicily. The moderns have endeavoured to ſhow, that theſe two plants are one and the ſame ſpecies of cyperus. It is under this genus that they are found in the catalogues and deſcriptions of plants publiſhed ſince the edition of Morriſon's work, where the papyrus is called *cyperus niloticus vel Syriacus maximus papyraceus*.

In the manuſcripts of the letters and obſervations of M. Lippi phyſician at Paris, who accompanied the envoy of Louis XIV. to the emperor of Abyſſinia, we find the deſcription of a cyperus which he had obſerved on the banks of the Nile in 1704. After having deſcribed the flowers, he ſays that many ears covered with young leaves are ſupported by a pretty long pedicle; and that many of thoſe pedicles, equally loaded and coming from one joint, form a kind of paraſol. The diſk of this paraſol is ſurrounded with a quantity of leaves which form a crown to the ſtem which ſupports it. The ſtem is a pretty long priſm, the corners of which are a little rounded; and the leaves, not at the top but at the ſide, are formed like the blade of a ſword; the roots are black and full of fibres; and this plant is called *cyperus Nileacus major, umbella multiplici*.

The ſame Lippi deſcribes another kind which riſes not ſo high: the ſtem and leaves correſpond with the former, but the ears form rather a kind of head than any thing like the ſpreading of an umbrella; this head was very ſoft, ſhining, and gilded rich and airy, much loaded, ſupported by pedicles which were joined together at the bottom like the knitting of a paraſol. It is called by him *cyperus Nileacus major aureo, diviſa pannicula*. Theſe two kinds of cyperus have a marked reſemblance in their leaves, their ſtem, their foliage, and the marſhy places where they grow. The only difference conſiſts in their ſize, and in the poſition of the ears, which ſerve to diſtinguiſh them; and they ſeem to bear a reſemblance to the papyrus and the ſari, deſcribed by ancient authors. The firſt is perhaps the papyrus, and the ſecond the ſari; but this is only conjecture.

The papyrus, which grew in the waters, is ſaid to have produced no ſeed; but this Mr Bruce very properly calls an abſurdity. "The form of the flower (ſays he) ſufficiently indicates, that it was made to reſolve itſelf into the covering of one, which is certainly very ſmall, and by its exalted ſituation and thickneſs of the head of the flower, ſeems to have needed the extraordinary covering it has had to protect it from the violent hold the wind muſt have had upon it. For the ſame reaſon, the bottom of the filaments compoſing the head are ſheathed in four concave leaves, which keep them cloſe together, and prevent injury from the wind getting in between them." Its plume was compoſed of ſlender pedicles, very long, and ſomewhat like hair, according to Theophraſtus. The ſame peculiarity exiſts in the papyrus of Sicily; and the ſame is found to exiſt in another kind of papyrus ſent from Madagaſcar by M. Poivre, correſpondent of the Academy of Sciences.

It is impoſſible to determine whether the papyrus of Sicily was uſed in any way by the Romans. In Italy it is called *papero*, and, according to Ceſalpin, *papero*.

This papyrus of Sicily has been cultivated in the garden of Piſa; and if we can depend on the authority of Ceſalpin, who himſelf examined the plant, it is different from the papyrus of Egypt.

The papyrus, ſays he, which is commonly called *pipero* in Sicily, has a longer and thicker ſtem than the plant cyperus. It riſes ſometimes to four cubits; the angles are obtuſe, and the ſtem at the baſe is ſurrounded with leaves growing from the root; there are no leaves on the ſtem even when the plant is at the greateſt perfection, but it carries at the top a large plume which reſembles a great tuft of diſhevelled hairs; this is compoſed of a great number of triangular pedicles, in the form of reeds; at the extremity of which are placed the flowers, between two ſmall leaves of a reddiſh colour like the cyperus. The roots are woody, about the thickneſs of reeds, jointed, and they throw out a great number of branches which extend themſelves in an oblique direction. Theſe are ſcented ſomewhat like the cyperus, but their colour is a lighter brown; from the lower part iſſue many ſmall fibres, and from the higher a number of ſtems ſhoot up, which in proportion as they are tender contain a ſweet juice.

The plume of the papyrus of Sicily is pretty well deſcribed in a ſhort account of it in the ſecond part of the *Muſæum de Boccone*. This plume is a tuft or aſſemblage of a great number of long ſlender pedicles, which grow from the ſame point of diviſion, are diſpoſed in the manner of a paraſol, and which carry at the top three long and narrow leaves, from which iſſue other pedicles, ſhorter than the former, and terminating in ſeveral knots of flowers. Micheli, in his *Nova Plantarum Genera*, printed at Florence 1728, has given an engraving of one of the long pedicles in its natural length: it is ſurrounded at the baſe with a caſe of about one inch and a half in height; towards the extremity it carries three long and narrow leaves, and four pedicles, to which are fixed the knots of flowers. Every pedicle has alſo a ſmall caſe ſurrounding its baſe. In ſhort, we find in the *Groſto Graphia* of Schenchzer a very particular deſcription of the plume of a kind of cyperus, which appears to be the Sicilian plant. From this account it appears that the papyrus of Sicily is well known to botaniſts. It were to be wiſhed that we had as particular a deſcription of the papyrus of Egypt; but meanwhile it may be obſerved, that theſe two plants have a near affinity to one another; they are confounded together by many authors; and according to Theophraſtus, the *ſari* and the *papyrus nilotica* have a decided character of reſemblance, and only differ in this, that the papyrus ſends forth thick and tall ſtems, which being divided into ſlender plates, are fit for the fabrication of paper; whereas the ſari has ſmall ſtems, conſiderably ſhorter, and altogether uſeleſs for any kind of paper.

The papyrus, which ſerved anciently to make paper, muſt not be confounded with the papyrus of Sicily, found alſo in Calabria; for, according to Srabo, the papyrus was to be found in no place excepting Egypt and India. The greateſt part of botaniſts have believed that the Sicilian plant is the ſame with the ſari of Theophraſtus; others have advanced that the papyrus of Egypt and the ſari were the ſame plant in two different ſtages of its exiſtence, or conſidered with reſpect to the greater or leſs height, which, according to them, might depend on the qualities of the ſoil, the difference of the climate, or other accidental cauſes. In proof of this, it is maintained, that there is an eſſential difference between the papyrus growing in the waters and the ſame plant growing on the banks of rivers and in marſhes. The firſt of theſe have thick and tall ſtems, and a plume in the form of a tuft of hair very long and ſlender, and without any ſeed: the ſecond differs from the firſt in all theſe particulars; it has a ſhorter and more ſlender ſtem, its plume is loaded with flowers, and of conſequence it produces ſeed. In whatever way we conſider theſe facts, it is ſufficient for us to know, that the difference between the papyrus and the ſari neither depends on climate, nor ſoil, nor on ſituation. The plants whoſe difference depended on theſe circumſtances, both grew in Egypt, and were both employed in the manufacture of paper. But it is an eſtabliſhed fact, that the ſari cannot be employed for this purpoſe.

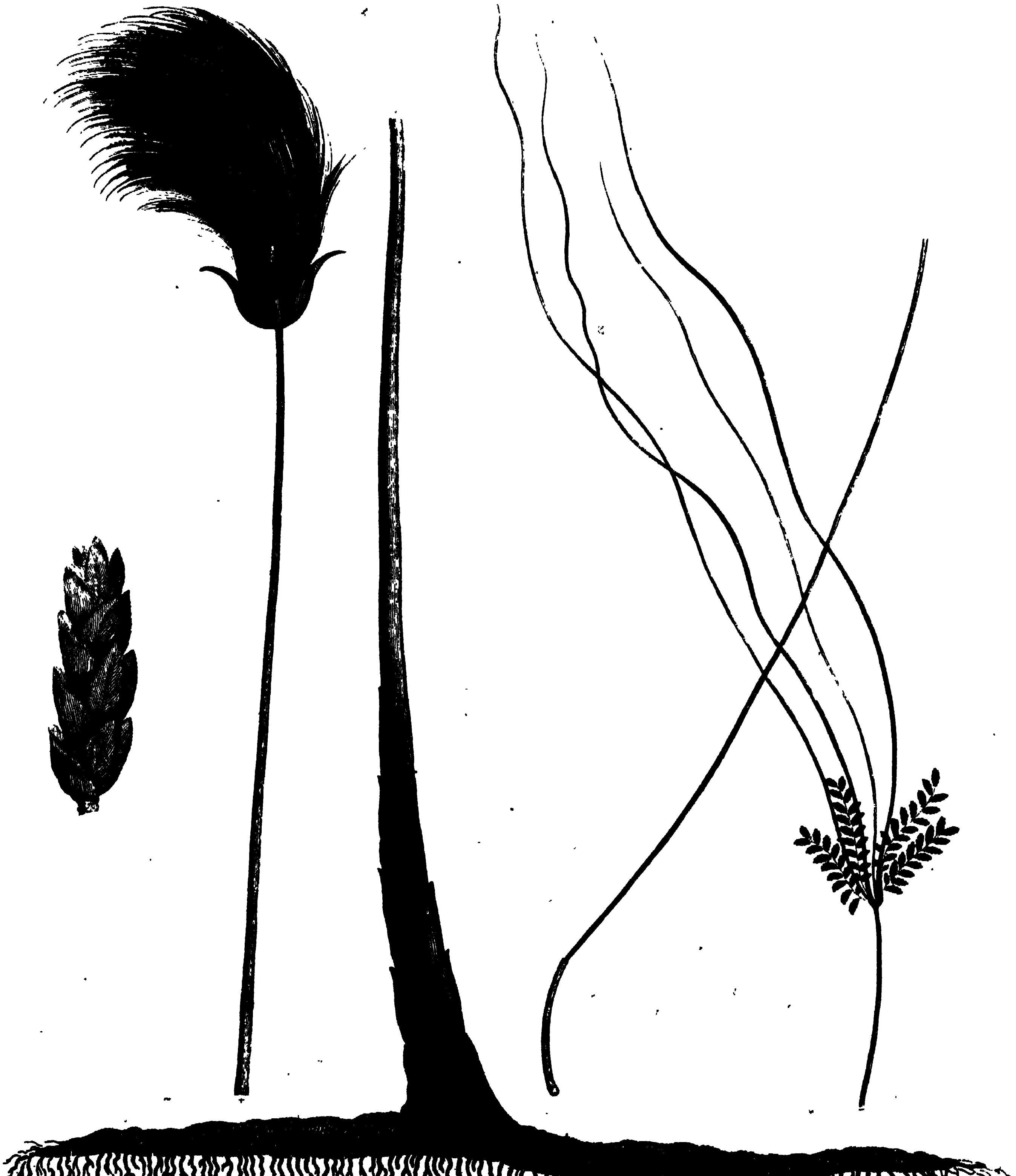
Finally, The papyrus of Sicily began to be known by botaniſts in 1570, 1572, 1583, at which periods the works of Lobel, of Guillandin, and of Ceſalpin, firſt appeared. The ancients had no manner of knowledge of this plant. Pliny makes no mention of it in his Natural Hiſtory; from which it is evident that it was neither uſed in Rome nor in Sicily. If he had ſeen this plant, he muſt have been ſtruck with its reſemblance to the papyrus and the ſari, as they were deſcribed by Theophraſtus; and ſince he gives a particular deſcription of theſe laſt mentioned, he would have moſt naturally hinted at their conformity to the Sicilian papyrus.

Among many dried plants collected in the Eaſt Indies by M. Poivre, there is a kind of papyrus very different from that of Sicily. It carries a plume compoſed of a conſiderable tuft of pedicles, very long, weak, ſlender, and delicate, like ſingle threads, terminating moſt frequently in two or three ſmall narrow leaves, without any knot of flowers between them; hence this plume muſt be altogether barren. Thoſe pedicles or threads are furniſhed with a pretty long membranous caſe, in which they are inſerted; and they iſſue from the ſame point of direction, in the manner of a paraſol. The plume, at its firſt appearance, is ſurrounded with leaves like the radii of a crown. The ſtem which ſupports it is, according to M. Poivre, about ten feet in height, where there is two feet under water; it is of a triangular form, but the angles are rounded; its thickneſs is about the ſize of a walking ſtaff which fills the hand.

The interior ſubſtance, although ſoft and full of fibres, is ſolid, and of a white colour. By this means the ſtem poſſeſſes a certain degree of ſtrength, and is capable of reſiſtance. It bends without breaking; and as it is extremely light, it ſerves in ſome ſort for a cane: The ſame M. Poivre uſed no other during a reſidence of ſeveral months at Madagaſcar. This ſtem is not of equal thickneſs in its whole length; it tapers inſenſibly from the thickeſt part towards the top. It is without knots, and extremely ſmooth. When this plant grows out of the waters, in places ſimply moiſt, it is much ſmaller, the ſtems are lower, and the plume is compoſed of ſhorter pedicles or threads, terminating at the top in three narrow leaves, a little longer than

Papyrus

Plate CCCLXXV.



A. Bell Prin. Wal. Sculptor fecit.

thoſe at the plume, when the plant grows in the water. From the baſe of theſe leaves iſſue ſmall knots of flowers, arranged as they are in the cyperus; but theſe knots are not elevated above the pedicles, they occupy the centre of the three leaves, between which they are placed, and form themſelves into a ſmall head. The leaves which ſpring from the root and the lower part of the ſtem reſemble exactly thoſe in the cyperus. This plant, which the inhabitants call *ſanga-ſanga*, grows in great abundance in their rivers and on their banks, but particularly in the river Tartas, near the Foule-point in Madagaſcar. The inhabitants of theſe cantons uſe the bark of this plant for mats; they make it alſo into ſails, into cordage for their fiſhing houſes, and into cords for their nets.

This kind of papyrus, ſo lately diſcovered, and different from the papyrus of Sicily by the diſpoſition of its flowers, ſhows, that there are two kinds of the cyperus which might eaſily be confounded with the papyrus of Egypt; whether we conſider, on the one hand, to what purpoſes the inhabitants of the places where they grow have made them ſubſervient; or, on the other compare their form, their manner of growth, and the points in which they reſemble each other. This compariſon can be eaſily made from the accounts which Pliny and Theophraſtus gave of the papyrus of Egypt, and by the figure and deſcription given by Proſper Alpin, after having obſerved the plant on the banks of the Nile. But if we can depend on the teſtimony of Strabo, who affirms that the papyrus is found nowhere but in Egypt and in India, it is perhaps poſſible that the papyrus of the iſle of Madagaſcar is the ſame with that of Egypt.

Whatever truth may be in this conjecture, the inhabitants of this iſland have never derived from it thoſe advantages which have immortalized the papyrus of Egypt. They have not made that celebrated paper, *quo uſu maxime humanitas, vita, conſtat et memoria.* This remarkable expreſſion of Pliny not only characterizes the Egyptian paper, but every kind which art and induſtry have ſubſtituted in its place.

PAR, in commerce, ſignifies any two things equal in value. See Exchange.

PARABLE, a fable or allegorical inſtruction, founded on ſomething real or apparent in nature or hiſtory, from which a moral is drawn by comparing it with ſomething in which the people are more immediately concerned; ſuch are the parables of Dives and Lazarus, of the Prodigal Son, of the Ten Virgins, &c. Dr Blair obſerves, that "of parables, which form a part of allegory, the prophetical writings are full; and if to us they ſometimes appear obſcure, we muſt remember, that in thoſe early times it was univerſally the mode throughout all the eaſtern nations to convey ſacred truths under myſterious figures and repreſentations."

PARABOLA. See *Conic Sections.*

PARABOLE. See Oratory, N° 84.

PARACELSUS (Aurelius Philip Theophraſtus Bombaſtus de Hohenheim), a famous phyſician, born at Einſidlen, a town in the canton of Schweitz in Swiſſerland. He was educated with great care by his father, who was the natural ſon of a prince, and in a little time made a great progreſs in the ſtudy of phyſic. He afterwards travelled into France, Spain, Italy, and Germany, in order to become acquainted with the moſt celebrated phyſicians. At his return to Swiſſerland, he ſtopped at Baſil, where he read lectures on phyſic in the German tongue. He was one of the firſt who made uſe of chemical remedies with ſucceſs, by which he acquired a very great reputation. Paracelſus gloried in deſtroying the method eſtabliſhed by Galen, which he believed to be very uncertain; and by this means drew upon himſelf the hatred of the other phyſicians. It is ſaid, that he boaſted of being able, by his remedies, to preſerve the life of man for ſeveral ages: but he himſelf experienced the vanity of his promiſes, by his dying at Saltzburg, in 1504, at 37 years of age according to ſome, and at 48 according to others. The beſt edition of his works is that of Geneva in 1658, in 3 vols. folio.

PARACENTESIS, an operation in ſurgery, commonly called *tapping*. See Surgery.

PARACLET, the Comforter, a name given to the Holy Ghoſt.

PARADE, in a military ſenſe, the place where troops aſſemble or draw together, to mount guard, or for any other purpoſe.

Parade, in fencing, implies the action of parrying or turning off any thruſt.

PARADIS (Francis Auguſtine) de Moncrif. See Moncrif.

PARADISE, a term principally uſed for the garden of Eden, in which Adam and Eve were immediately upon their creation.

As to this terreſtrial paradiſe, there have been many inquiries about its ſituation. It has been placed in the third heaven, in the orb of the moon, in the moon itſelf, in the middle region of the air, above the earth, under the earth, in the place poſſeſſed by the Caſpian ſea, and under the arctic pole. The learned Huetius places it upon the river that is produced by the conjunction of the Tigris and Euphrates, now called the *river of the Arabs*, between this conjunction and the diviſion made by the ſame river before it falls into the Perſian ſea. Other geographers have placed it in Armenia, between the ſources of the Tigris, the Euphrates, the Araxes, and the Phaſis, which they ſuppoſe to be the four rivers deſcribed by Moſes. But concerning the exact place we muſt neceſſarily be very uncertain, if indeed it can be thought at all to exiſt at preſent, conſidering the many changes which have taken place on the ſurface of the earth ſince the creation.

"Learned men (ſays Mr Miln *) have laboured to find out the ſituation of Paradiſe, which ſeems to be but a vague and uncertain inquiry; for the Moſaic deſcription of it will not ſuit any place on the preſent globe. He mentions two rivers in its vicinity, *viz.* Piſon and Gihon, of which no veſtiges can now be found. The other two ſtill remain, *viz.* the Hiddekel, ſuppoſed to be the Tigris, and the Euphrates, whoſe ſtreams unite together at a conſiderable diſtance above the Perſian gulf; in ſome part of which, it is highly probable the happy garden once lay (A). This gulf

* *Phyſico-Theol. Lectures.*

(A) "God (we are told) *placed at the eaſt of the garden of Eden cherubims and a flaming ſword, which turned every* is eaſtward both of the land of Midian and the wilderneſs of Sinai; in one of which places Moſes wrote his hiſtory. But ſince the formation of this earth, it has undergone great changes from earthquakes, inundations, and many other cauſes. The garden, however, ſeems to have been a peninſula, for the way or entrance into it is afterwards mentioned. We are told that a 'river went out of it;' which, according to ſome, ſhould be rendered 'run on the outſide of it,' and thus gave it the form of a horſe-ſhoe: for had the Euphrates run through the middle of the garden, one half of it would have been uſeleſs to Adam, without a bridge or boat wherewith to have croſſed it."

The learned authors of the Univerſal Hiſtory, in their account of rarities natural and artificial in Syria, mention "a ſpot which is ſtill ſhown as the place where once ſtood the garden of Eden, or Terreſtrial Paradiſe. And indeed it is in all reſpects ſo beautiful and rich, and yields ſo delightful a proſpect from the adjacent hills, that there is hardly another place in the world that has a fairer title to the name it bears. Its proximity to Damaſcus, the capital of Syria, near the fountain head of the Jordan; its ſituation between the Tigris or Hiddekel, the Euphrates, the Phaſis or Phiſon, the Araxes or Gihon (which laſt has thoſe names from its vaſt rapidity above all other known rivers), its bordering upon the land of Chus, famed for its fine gold; all theſe and many other marks ſpecified by Moſes, together with its charming and ſurpriſing fruitfulneſs, and conſtant verdure, have induced a great number of commentators to ſettle that celebrated and ſo much ſought-after ſpot here, and to deem it the moſt valuable of all the natural rarities of this country."

Chriſtians, however, need not be told, that however curious or amuſing this inquiry may be, the determination of it is of no importance, ſince we are all well aſſured that the celeſtial paradiſe is that place of pure and refined delight in which the ſouls of the bleſſed enjoy everlaſting happineſs.

It may not be improper, however, in this place to give a deſcription of the paradiſe of the Mohammedans. The ſenſuality and abſurdity of that impoſtor muſt be apparent to all men. Their religion has no conſiſtency in its parts, and the deſcriptions of the future enjoyments of the faithful are miſerable inſtances of human weakneſs and folly.

"The paradiſe of the Mohammedans is ſaid by them to be ſituated above the ſeven heavens, or in the ſeventh, and next under the throne of God; and to expreſs the amenity of the place, they tell us that the earth of it is of the fineſt wheat flour, or of the pureſt muſk, or of ſaffron; and that its ſtones are pearls and jacinths, the walls of its buildings enriched with gold and ſilver, and the trunks of all its trees of gold, amongſt which the moſt remarkable is the tree *tuba*, or tree of happineſs. They pretend that this tree ſtands in the palace of Mohammed, though a branch of it will reach to the houſe of every true believer, loaded with pomegranates, dates, grapes, and other fruits of ſurpriſing bigneſs, and delicious taſtes, unknown to mortals. If a man deſires to eat of any particular kind of fruit, it will immediately be preſented to him; or if he chooſes fleſh, birds ready dreſſed will be ſet before him, and ſuch as he may wiſh for. They add, that this tree will ſupply the bleſſed, not only with fruit, but with ſilk garments alſo, and beaſts to ride on, adorned with rich trappings, all which will burſt forth from the fruit; and that the tree is ſo large, that a perſon mounted on the fleeteſt horſe would not be able to gallop from one end of its ſhade to the other in 100 years. Plenty of water being one of the greateſt additions to the pleaſantneſs of any place, the Alcoran often ſpeaks of the rivers of paradiſe as the principal ornament. Some of theſe rivers are ſaid to flow with water, ſome with milk, ſome with wine, and others with honey: all of them have their ſources in the root of this tree of happineſs; and, as if theſe rivers were not ſufficient, we are told that the garden of this paradiſe is alſo watered by a great number of leſſer ſprings and fountains, whoſe pebbles are rubies and emeralds, their earth of camphor, their beds of muſk, and their ſides of ſaffron. But all thoſe glories will be eclipſed by the reſplendent and exquiſite beauty of the girls of paradiſe, the enjoyment of whoſe company will conſtitute the principal felicity of the faithful. Theſe (they ſay) are not formed of clay, as mortal women, but of pure muſk; and are, as their prophet often affirms in his Alcoran, free from all the natural defects and inconveniences incident to the ſex. Being alſo of the ſtricteſt modeſty, they keep themſelves ſecluded from public view in pavilions of hollow pearls, ſo large, that, as ſome traditions have it, one of them will be no leſs than 16, or, as others ſay, 60 miles long, and as many broad. With theſe the inhabitants of paradiſe may taſte pleaſures in their height; and for this purpoſe will be endowed with extraordinary abilities, and enjoy a perpetual youth."

Paradise Loſt, the name of a modern epic poem, the firſt and fineſt of thoſe compoſed by Milton.

The ſubject of this poem is extraordinary; it had never before been attempted, and ſeemed to be above the efforts of human genius. Angels and devils are not the machinery, but the principal actors in it; ſo that what would appear marvellous in any other compoſition, is in this only the natural courſe of events.—The poet's intention was, as he expreſſes it himſelf, to vindicate the ways of God to men. How far Milton was happy in the choice of his ſubject, may be queſtioned,

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every way, to keep the way of the tree of life. In Scripture, the extraordinary judgments of God are ſaid to be executed by his angels, who are ſometimes compared to flames of fire. Therefore the cherubim and the flaming ſword may probably mean nothing more than that a large portion of ground on the eaſtward of Paradiſe was ſet on fire during the above awful occaſion, and continued burning with ſuch violence, that the flame thereof at a diſtance appeared like a brandiſhed ſword, turning every way with the wind. Now if the ſoil of Eden was bituminous, like that of Gomorrah (which was once ſo fertile as to be compared to the "garden of the Lord"), the fire would continue burning till it produced the ſame effect in the one place as it did in the other, and turned a great part of that tract into ſea: which ſeems to countenance the opinion of thoſe who place the ſituation of Paradiſe in ſome part of the Perſian gulf."

queſtioned. It has led him into difficult ground, though it certainly ſuited the daring ſublimity of his genius. It is a ſubject for which he alone was fitted; and, in the conduct of it, he has ſhown a ſtretch both of imagination and invention which is perfectly wonderful.

Bird of Paradiſe. See the following article.

Plate cccLXXIV. PARADISEA, in ornithology; a genus of birds belonging to the order of picæ. The beak is covered with a belt or collar of downy feathers at the baſe; and the feathers on the ſides are very long.

"Birds of this genus (ſays Latham) have the bill ſlightly bending; the baſe covered with velvet-like feathers. The noſtrils are ſmall, and concealed by the feathers. The tail conſiſts of 10 feathers; the two middle ones, and ſometimes more in ſeveral of the ſpecies, are very long, and webbed only at the baſe and tips. The legs and feet are very large and ſtrong: they have three toes forward, one backward, and the middle connected to the outer one as far as the firſt joint. The whole of this genus have, till lately, been very imperfectly known; few cabinets poſſeſſing more than one ſpecies, viz. the Greater, or what is called the *common bird of Paradiſe;* nor has any ſet of birds given riſe to more fables, the various tales concerning which are to be found in every author; ſuch as, their never touching the ground from their birth to death; living wholly on the dew; being produced without legs; and an hundred ſuch ſtories, too ridiculous even to mention. This laſt error is ſcarcely at this moment wholly eradicated. The circumſtance which gave riſe to it did not indeed at firſt proceed from an intention to deceive, but merely from accident. In the parts of the world which produce theſe birds, the natives made uſe of them as *aigrets*, and other ornaments of dreſs; and in courſe threw away the leſs brilliant parts. The whole trouble they were at on this occaſion, was merely to ſkin the bird, and, after pulling off the legs, coarſer parts of the wings, &c. thruſt a ſtick down the throat into the body, letting an inch or two hang out of the mouth, beyond the bill; on the bird's drying, the ſkin collapſed about the ſtick, which became fixed, and ſupported the whole. They had then no more to do than to put this end of it into a ſocket fitted to receive it, or faſten it in ſome manner to the turban, &c. By degrees theſe were imported into the other iſles for the ſame uſes, and afterwards were coveted by the Japaneſe, Chineſe, and Perſians, in whoſe countries they are frequently ſeen, as well as in many parts of India; the grandees of theſe laſt parts not only ornamenting themſelves with theſe beautiful plumes, but adorning even their horſes with the ſame."

The Portugueſe firſt found theſe birds on the iſland of Gilolo, the Papua iſlands; and New Guinea; and they were known by the name of *birds of the ſun*. The inhabitants of Ternate call them *manuco dewata*, the "bird of God:" whence the name *manuco diata*, uſed by ſome naturaliſts, is derived. According to ſome fabulous accounts, this bird has no legs, lives conſtantly on wing, and in the air; and, in confirmation of theſe accounts, the legs of all the dead birds offered to ſale were cut off. But the inhabitants of Aroo, who reſort yearly to Banda, undeceived the Dutch, and freed them from thoſe prejudices. Another reaſon for cutting off the legs is, that the birds are more eaſily preſerved without them; beſides that the Moors wanted the birds without legs, in order to put them on in their mock fights as ornaments to their helmets. The inhabitants of Aroo, however, have brought the birds with legs for 80 or 90 years; and Pijafetta, ſhipmate of Ferdinand Magellan, proved, about the year 1525, an eye witneſs that theſe creatures were not without legs. However, the peculiar length and ſtructure of their ſcapular feathers hinders them from ſettling, in high winds, on trees; and when they are thrown on the ground by theſe winds, they cannot riſe again. If taken by the natives, they are immediately killed, as their food is not known; and they defend themſelves with great courage with their formidable bills.

Latham enumerates eight ſpecies, but ſuſpects there may be more. We ſhall ſatisfy ourſelves with the following:

1. The largeſt bird of Paradiſe is commonly two feet four inches in length; the head is ſmall; the bill hard and long, of a pale colour. The head and back part of the neck is lemon coloured, a little black about the eyes; about the neck, the bird is of the brighteſt gloſſy emerald green, ſoft like velvet; as is alſo the breaſt, which is black: the wings are large, and cheſnut coloured; the back part of the body is covered with long, ſtraight, narrow feathers, of a pale brown colour, ſimilar to the plumes of the oſtrich. Theſe feathers are ſpread when the bird is on the wing; for which reaſon he can keep very long in the air. On both ſides of the belly are two tufts of ſtiff and ſhorter feathers, of a golden yellow, and ſhining. From the rump proceed two long ſtiff ſhafts, which are feathered on their extremities.

Theſe birds are not found in Key, an iſland fifty Dutch miles eaſt of Banda; but they are found at the Aroo iſlands, lying 15 Dutch miles farther eaſt than Key, during the weſterly or dry monſoon; and they return to New Guinea as ſoon as the eaſterly or wet monſoon ſets in. They come always in a flock of 30 or 40, and are led by a bird which the inhabitants of Aroo call the *king*. This leader is black, with red ſpots; and conſtantly flies higher than the reſt of the flock, which never forſake him, but ſettle as ſoon as he ſettles: a circumſtance that frequently proves their ruin when the king lights on the ground, whence they are not able to riſe on account of the ſingular ſtructure and diſpoſition of their plumage. They are likewiſe unable to fly with the wind, which would ruin their looſe plumage; but take their flight conſtantly againſt it, cautious not to venture out in hard blowing weather, as a ſtrong wind frequently obliges them to come to the ground. During their flight they cry like ſtarlings. Their note, however, approaches more to the croaking of ravens; which is heard very plainly when they are in diſtreſs from a freſh gale blowing on the back of their plumage. In Aroo, theſe birds ſettle on the higheſt trees, eſpecially on the ficus benjamina of the hortus malabaricus, commonly called the *waringa tree*. The natives catch them with birdlime or in nooſes, or ſhoot them with blunt arrows; but though ſome are ſtill alive when they fall into their hands, the catchers kill them immediately, and ſometimes cut the legs off; then they draw out the entrails, dry and fumigate the bodies

dies with ſulphur or ſmoke only, and ſell them at Banda for half a rixdollar each; but at Aroo they may be bought for a ſpike-nail or a piece of old iron. Flocks of theſe birds are often ſeen flying from one iſland to the other againſt the wind. In caſe they find the wind become too powerful, they fly ſtraight up into the air, till they come to a place where it is leſs agitated, and then continue their flight. During the eaſtern monſoon their tails are moulted, ſo that they have them only during four months of the weſtern monſoon.

2. The ſmaller bird of Paradiſe is about 20 inches long. His beak is lead-coloured, and paler at the point. The eyes are ſmall, and encloſed in black about the neck. The head and back of the neck are of a dirty yellow; the back of a grayiſh yellow; the breaſt and belly of a duſky colour; the wings ſmall, and cheſnut-coloured. The long plumage is about a foot in length, and paler than in the large ſpecies; as in general the colours of this bird are leſs bright than the former. The two long feathers of the tail are conſtantly thrown away by the natives. This is in all reſpects like the greater ſort; and they likewiſe follow a king or leader, who is, however, blacker, with a purpliſh caſt, and finer in colour than the reſt. The neck and bill are larger in the male than in the female. They rooſt on the tops of the higheſt trees, and do not migrate like the other kind. Some ſay, that the birds of this ſpecies, finding themſelves weak through age, ſoar ſtraight towards the ſun till they are tired, and fall dead to the ground. The natives draw the entrails, ſear the birds with a hot iron, and put them in a tube of bamboo for preſervation.

3. and 4. The large black bird of Paradiſe is brought without wings or legs for ſale; ſo that no accurate deſcription of it hath yet been given. Its figure, when ſtuffed, is narrow and round, but ſtretched in length to the extent of four ſpans. The plumage on the neck, head, and belly, is black and velvet-like, with a hue of purple and gold, which appears very ſtrong. The bill is blackiſh, and one inch in length. On both ſides are two bunches of feathers, which have the appearance of wings, although they be very different, the wings being cut off by the natives. This plumage is ſoft, broad, ſimilar to peacocks feathers, with a glorious gloſs and greeniſh hue, and all bent upwards; which Valentine thinks is occaſioned by the birds being kept in hollow bamboo-reeds. The feathers of the tail are of unequal length; thoſe next to the belly are narrow, like hair; the two uppermoſt are much longer, and pointed; thoſe immediately under them are a ſpan and a half longer than the upper ones; they are ſtiff, on both ſides fringed with a plumage like hair, black above, but gloſſy below. Birds of this kind are brought only from one particular place of New Guinea. Beſides the large black bird of Paradiſe, there is ſtill another ſort, whoſe plumage is equal in length, but thinner in body, black above, and without any remarkable gloſs, not having thoſe ſhining peacock feathers which are found on the greater ſpecies. This wants likewiſe the three long pointed feathers of the tail belonging to the larger black ſpecies.

5. The white bird of Paradiſe is the moſt rare, and has two varieties; one quite white, and the other black and white. The former is very rare. The ſecond has the fore part black, and the back part white; with 12 crooked wiry ſhafts, which are almoſt naked, tho' in ſome places, covered with hairs.

6. In the year 1689 a new ſpecies of the black bird of paradiſe was ſeen in Amboyna. This was only one foot in length, with a fine purple hue, a ſmall head, and a ſtraight bill. On its back, near the wings, are feathers of a blue and purple colour, as on the other birds of Paradiſe; but under the wings and over all the belly they are yellow coloured, as in the common ſort: on the back of the neck they are mouſe-coloured mixed with green. It is remarkable in this ſpecies, that there are before the wings two roundiſh tufts of feathers, which are green-edged, and may be moved at pleaſure by the bird, like wings. Inſtead of a tail, he has 12 or 13 black, naked, wire-like ſhafts, hanging promiſcuouſly like feathers. His legs are ſtrong, and have ſharp claws. The head is remarkably ſmall; and the eyes are alſo ſmall, and ſurrounded with black.

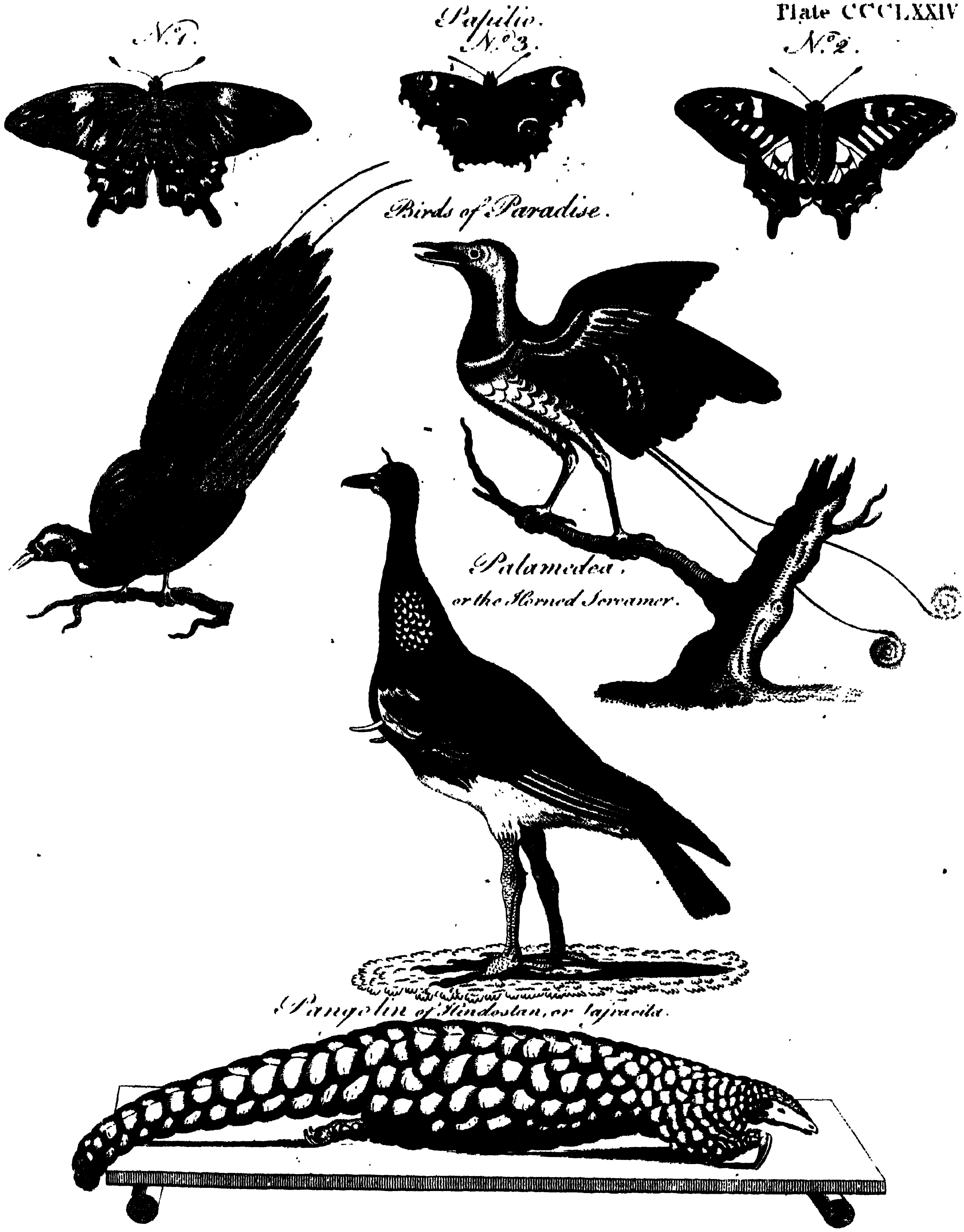
7. The laſt ſpecies we ſhall mention is the king's bird. This creature is about ſeven inches long, and ſomewhat larger than a titmouſe. Its head and eyes are ſmall; the bill ſtraight; the eyes included in circles of black plumage; the crown of the head is flame-coloured; the back of the neck blood-coloured; the neck and breaſt of a cheſnut colour, with a ring of the brighteſt emerald-green. Its wings are in proportion ſtrong; and the quill-feathers dark, with red ſhining plumes, ſpots, and ſtripes. The tail is ſtraight, ſhort, and brown. Two long naked black ſhafts project from the rump, at leaſt a hand-breadth beyond the tail; having at their extremities ſemilunar twiſted plumage, of the moſt glaring green colour above, and duſky below. The belly is white and green ſprinkled; and on each ſide is a tuft of long plumage, feathered with a broad margin, being on one ſide green and on the other duſky. The back is blood-red and brown, ſhining like ſilk. The legs are in ſize like thoſe of a lark, three fore toes and one back toe. This bird aſſociates not with any of the other birds of Paradiſe; but flits ſolitary from buſh to buſh, wherever he ſees red berries, without ever getting on tall trees.

Thoſe who wiſh for minuter information reſpecting this curious genus, we muſt refer to Latham's Synopſis, and Buffon's Birds, Vol. IX. &c.

PARADOX, παραδοξον, in philoſophy, a propoſition ſeemingly abſurd, as being contrary to ſome received opinions, but yet true in fact.

The vulgar and illiterate take almoſt every thing, even the moſt important, upon the authority of others, without ever examining it themſelves. Although this implicit confidence is ſeldom attended with any bad conſequences in the common affairs of life, it has nevertheleſs, in other things, been much abuſed; and in political and religious matters has produced fatal effects. On the other hand, knowing and learned men, to avoid this weakneſs, have fallen into the contrary extreme: ſome of them believe every thing to be unreaſonable, or impoſſible, that appears ſo to their firſt apprehenſion; not adverting to the narrow limits of the human underſtanding, and the infinite variety of objects, with their mutual operations, combinations, and affections, that may be preſented to it.

Plate CCCLXXIV



A. Bell Prin. Wal. Sculpt.

It muſt be owned, that credulity has done much more miſchief in the world than incredulity has done, or ever will do; becauſe the influences of the latter extend only to ſuch as have ſome ſhare of literature, or affect the reputation thereof. And ſince the human mind is not neceſſarily impelled, without evidence, either to belief or unbelief, but may ſuſpend its aſſent to, or diſſent from, any propoſition till after a thorough examination; it is to be wiſhed that men of learning, eſpecially philoſophers, would not haſtily, and by firſt appearances, determine themſelves with reſpect to the truth or falſehood, poſſibility or impoſſibility, of things.

A perſon who has made but little progreſs in the mathematics, though in other reſpects learned and judicious, would be apt to pronounce it impoſſible that two lines, which were nowhere two inches aſunder, may continually approach towards one another, and yet never meet, though continued to infinity: and yet the truth of this propoſition may be eaſily demonſtrated. And many, who are good mechanics, would be as apt to pronounce the ſame, if they were told, that though the teeth of one wheel ſhould take equally deep into the teeth of three others, it ſhould affect them in ſuch a manner, that, in turning it any way round its axis, it ſhould turn one of them the ſame way, another the contrary way, and the third no way at all.

No ſcience abounds more with paradoxes than geometry: thus, that a right line ſhould continually approach to the hyperbola, and yet never reach it, is a true paradox; and in the ſame manner a ſpiral may continually approach to a point, and yet not reach it in any number of revolutions, however great.

The Copernican ſyſtem is a paradox to the common people; but the learned are all agreed as to its truth. Geometricians have of late been accuſed of maintaining paradoxes; and ſome do indeed uſe very myſterious terms in expreſſing themſelves about aſymptotes, the ſums of infinite progreſſions, the areas comprehended between curves and their aſymptotes, and the ſolids generated from theſe areas, the length of ſome ſpirals, &c. But all theſe paradoxes and myſteries amount to no more than this; that the line or number may be continually acquiring increments, and thoſe increments may decreaſe in ſuch a manner, that the whole line or number ſhall never amount to a given line or number. The neceſſity of admitting it is obvious from the nature of the moſt common geometrical figures: thus, while the tangent of a circle increaſes, the area of the correſponding ſector increaſes, but never amounts to a quadrant. Neither is it difficult to conceive, that if a figure be concave towards a baſe, and have an aſymptote parallel to the baſe (as it happens when we take a parallel to the aſymptote of the logarithmic curve, or of the hyperbola, for a baſe), that the ordinate in this caſe always increaſes while the baſe is produced, but never amounts to the diſtance between the aſymptote and the baſe. In like manner, a curvilinear area may increaſe while the baſe is produced, and approach continually to a certain finite ſpace, but never amount to it; and a ſolid may increaſe in the ſame manner, and yet never amount to a given ſolid. See *M'Laurin's Fluxions*. See LOGARITHMIC *Curve*.

PARADOXI, a ſort of mimes or buffoons among the ancients, who entertained the people with extempore effuſions of drollery. They were alſo called *Paradoxologi*, *Ordonarii*, *Neanicologi*, and *Aretalogi*. See MIMI.

PARAGAUDÆ, among the Romans, were wreaths of gold, or ſilk and gold, interwoven in, not ſewed to their garments. The garment was ſometimes of one colour, with one paragaudæ; ſometimes of two colours, with two paragaudæ; of three colours, with three paragaudæ, &c. They were worn both by men and women.

PARAGOGE, in grammar, a figure whereby a letter or ſyllable is added to the end of a word; as *med*, for *me*; *dicier*, for *dici*, &c.

PARAGRAPH, in general, denotes a ſection or diviſion of a chapter; and in references is marked thus, ¶.

PARAGUAY, or LA PLATA, a province of Spaniſh America, bounded on the north by the river of the Amazons; on the eaſt, by Brazil; on the ſouth, by Patagonia; and on the weſt, by Chili and Peru. This country was firſt diſcovered by Sebaſtian Cabot, who, in 1526, paſſed from Rio de la Plata to the river Parana in ſmall barks, and thence entered the river called *Uruguay*. It was not, however, thoroughly reduced till the Jeſuits obtained poſſeſſion of it. A few of theſe went to Paraguay ſoon after the city of Aſſumption was founded, and converted about 50 Indian families, who ſoon induced many others to follow their example, on account of the peace and tranquillity they enjoyed under the fathers. They had long reſiſted the Spaniards and Portugueſe; but the Jeſuits, by learning their language, conforming to their manners, &c. ſoon acquired great authority among them; till at laſt, by ſteadily purſuing the ſame artful meaſures, they arrived at the higheſt degree of power and influence, being in a manner the abſolute ſovereigns of a great part of this extenſive country; for above 350,000 families are ſaid to have been ſubject to them, living in obedience and awe bordering on adoration, yet procured without the leaſt violence or conſtraint.

Gent. Mag. 1753. We have the following particular account of the miſſions of Paraguay, in the words of Don Jorge Juan, &c. "The territories of the miſſions of Paraguay comprehended not only the province of that name, but alſo a great part of the provinces of Santa Cruz de la Sierra, Tucuman, and Buenos Ayres. The temperature (A) of the air is good, though ſomewhat moiſt, and in ſome parts rather cold: the ſoil in many places is fer-

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(A) The climate of Paraguay differs but little from that of Spain; and the diſtinctions between the ſeaſons are much the ſame. In winter, indeed, violent tempeſts of wind and rain are very frequent, accompanied with ſuch dreadful claps of thunder and lightning as fill the inhabitants, though uſed to them, with terror and conſternation. In ſummer, the exceſſive heats are mitigated by gentle breezes, which conſtantly begin at eight or nine in the morning.

tile (B); and produces in great abundance not only the fruits and vegetables peculiar to America, but alſo thoſe of Europe which have been introduced there. The chief articles of their commerce are cotton, tobacco, ſome ſugar, and the herb called *Paraguay*. Every town gathers annually more than 2000 arrobas of cotton, of a quarter of an hundred weight each, which the Indians manufacture into ſtuffs. There are alſo great quantities of tobacco produced. But the chief article is the herb Paraguay: for it grows only in the diſtricts of the miſſions; and there is a vaſt conſumption of this herb in all the provinces of Chili and Peru, eſpecially of that called *camini*, which is the pure leaf; the infuſion of which is called *mate*, and is drank by the inhabitants of Lima twice a day in lieu of tea or chocolate. The mate which is made by the infuſion of the ſtalk is not ſo much eſteemed.

“ 'Tis now almoſt two centuries ſince theſe miſſions were firſt ſet on foot by the Jeſuits. The bad management of the Portugueſe greatly favoured the views of theſe fathers. There was a nation of Indians called *Guaranies*, ſome whereof were ſettled upon the banks of the rivers Uruguay and Parana, and others a hundred leagues higher up in the country to the north-weſt of Guayra. The Portugueſe frequently came upon them, and by force carried away as many as they thought proper to their plantations, and made ſlaves of them. Offended by ſuch treatment, the Guaranies reſolved to quit their ſettlements in the neighbourhood of the Portugueſe, and to remove into the province of Paraguay. Accordingly a migration of 12,000 perſons great and ſmall, enſued. Theſe the Jeſuits ſoon converted; and having had the like ſucceſs in converting about an equal number of the natives of Tape, a diſtrict in Paraguay, they united the two nations, and laid the foundation of their future dominion. Theſe fathers ſeem to have trode in the ſteps of the firſt Incas, and to have civilized nations and converted ſouls in order to acquire ſubjects. According to a very exact account taken in the year 1734, there were then 32 towns of the Guaranies, which were reckoned to contain above 30,000 families; and as the new converts were continually increaſing, they were then about laying the foundations of three new towns. There were alſo then ſeven very populous towns inhabited by the converted Chiquito Indians, and they were preparing to build others for the reception of the new converts of that nation which were daily made.

“ The miſſions of Paraguay are ſurrounded on all ſides with wild or unconverted Indians; ſome of whom live in friendſhip with the towns, but others haraſs them by frequent incurſions. The father miſſionaries frequently viſit theſe Indians, and preach to them; and from theſe expeditions they ſeldom return without bringing along with them ſome new converts to incorporate with their civilized ſubjects. In the performance of this duty they ſometimes penetrate 100 leagues into thoſe uncultivated tracts where wild Indians range; and it is obſerved that they meet with the leaſt ſucceſs amongſt thoſe nations with whom any fugitive Meſtizos, or Spaniſh criminals, have taken refuge. The diligence of theſe fathers is certainly worthy the imitation of the Proteſtant clergy.

“ Every town has its curate, who is aſſiſted by one, and very often by two prieſts of the ſame order, according to the largeneſs and extent of the town and its diſtrict. Theſe two or three prieſts, together with ſix boys who aſſiſt them in the ſervice of the church, form a ſmall college in every town, wherein the hours and other exerciſes are regulated with the ſame formality and exactneſs as in the large colleges in the cities of Peru and Chili. The moſt troubleſome part of the duty of the aſſiſtant prieſts are the perſonal viſitations which they are obliged to make to the Indians to prevent their giving themſelves up to idleneſs; for ſuch is the ſlothfulneſs of the Guaranies, that if they were not very carefully looked after, the ſociety would receive no benefit or advantage from them. They alſo attend the public ſhambles, where the cattle neceſſary for the ſuſtenance of the Indians are daily ſlaughtered, and diſtribute the fleſh amongſt all the families in the town, in proportion to the number of perſons whereof each family conſiſts; ſo that all may have what is neceſſary,

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(B) It produces maize, manioc, and potatoes, beſides many fruits and ſimples unknown in Europe. Vines, however, do not thrive, except in ſome particular places. Wheat has alſo been tried; but it is only uſed for cakes, and other things of that kind. There are great numbers of poiſonous ſerpents, and others of enormous ſize, many of which live on fiſh. It produces alſo abundance of ſugar, indigo, pimento, ipecacuanha, and variety of other drugs; and above all the herb Paraguay, which it exports to the value of 100,000l. annually, to the provinces of Chili and Peru. It is the leaf of a middle-ſized tree, reſembling an orange tree, in taſte not unlike mallows. There are three gatherings: firſt, the buds before it unfolds its leaves, which is the beſt, but ſooneſt ſubject to decay; the ſecond gathering is the full grown leaves at the firſt expanſion; the third is when the leaves have remained on ſome time after they are full blown. The leaves are roaſted, and then kept in pits dug in the ground to be ready for ſale. Theſe trees grow principally in the moraſſes on the eaſt ſide of Paraguay, but now are diſtributed all over the country. The manner of uſing it is, to dry and reduce it almoſt to powder, then put it into a cup with lemon juice and ſugar; boiling water is then poured on it, and the liquor drank as ſoon as may be. It is ſuppoſed to be ſerviceable in all diſorders of the head, breaſt, and ſtomach; it preſerves the miners from the noxious mineral ſteams with which they would otherwiſe be ſuffocated; is a ſovereign remedy in putrid fevers and the ſcurvy; allays hunger; and purifies all kind of water, by infuſing it therein. The country is diverſified with foreſts, mountains, low lands (great part of the year under water), fertile meadows, and moraſſes. Almoſt every foreſt abounds with bees, which have their hives in hollow trees. Beſides cotton, the country produces hemp, flax, corn, rice, and wool; and there are ſuch numbers of wild cattle, that they are killed only for their hides. The natives differ not materially from thoſe deſcribed under the article AMERICA.

ceſſary, none what is ſuperfluous. They alſo viſit the ſick, and ſee that they are properly taken care of. They are generally employed the whole day in theſe affairs, ſo that they have ſeldom time to aſſiſt the curate in his ſpiritual functions. All the boys and girls in the pariſh go to church every day in the week (except on feſtivals and Sundays), where they are inſtructed by the curate. On Sundays the whole pariſh goes to church to be inſtructed. The curate is beſides obliged to go to confeſs the ſick, and to adminiſter the viaticum to thoſe who deſire it, and alſo to perform all the other functions peculiar to this office. In ſtrictneſs the curate ſhould be appointed in this manner. The ſociety ſhould nominate three perſons to the governor of Buenos Ayres (in whoſe government the miſſions of Paraguay are included), as being vice patron of the miſſions, that he may chooſe one of them for curate; and the curates ſhould be inſtructed in the duties of their office by the biſhop: but as the provincials of the order can beſt judge who are properly qualified for the office, the governor and biſhop have ceded their rights to them, and by them the curates are always appointed. The miſſions of the Guaranies and the miſſions of the Chiquitos, into which the miſſions of Paraguay are divided, have each their diſtinct father-ſuperior, by whom the coadjutors or aſſiſtant curates of the ſeveral towns in the reſpective diviſions are appointed. Theſe ſuperiors are continually viſiting the towns, to ſee that they be well governed, and to endeavour to improve and augment them. They likewiſe from time to time take care to ſend out ſome fathers of the order into the countries of the wild Indians to make new converts. The better to enable him to diſcharge theſe duties, the ſuperior of the Guaranies is aſſiſted by two vice-ſuperiors; one of whom reſides in Parana, the other upon the banks of the river Uruguay, and the ſuperior himſelf reſides in the town of Candelaria. The poſt of ſuperior of the Chiquitos is not near ſo troubleſome as that of the ſuperior of the Guaranies; for the Chiquitos are not only leſs numerous, but much more docile and induſtrious than the Guaranies, ſo that they need not be continually watched and attended in order to prevent their idleneſs. The king allows an annual ſtipend of 300 pezas to each curate of the Guaranies, for the maintenance of himſelf and his aſſiſtants. The money is paid to the ſuperior, who iſſues out monthly to each curate as much as is neceſſary for his ſubſiſtence; and when they want any thing extraordinary, their wants are ſupplied upon application to him. But the Chiquitos maintain their own curates. In every town there is a plantation ſet apart for the maintenance of the curate, which is cultivated by the joint labour of all the inhabitants. The produce of theſe plantations is generally more than ſufficient for the ſubſiſtence of the curates, and the ſurplus is ſold to buy ornaments for the churches. Nor are the curates the ſpiritual rectors of the towns only; they are alſo in effect the civil governors. It is true there are in every town of the miſſions a governor, regidores, and alcaldes, as there are in the other towns and cities under the Spaniſh government. But though the governor is elected by the Indians, he muſt be approved by the curate before he enters upon his office; nor can he chaſtiſe or puniſh delinquents without the curate's permiſſion. The curate examines thoſe who are accuſed of offences; and if he finds them guilty, delivers them to the governor to be puniſhed, according to the nature and quality of the offence commited. He ſometimes orders them to be impriſoned for a few days, ſometimes to faſt, and, when the fault is conſiderable, to be whipped, which is the ſevereſt puniſhment that is ever inflicted; for the regulations and inſtructions of the curates have been ſo efficacious, that murder and ſuch like heinous crimes are never here committed. And even before they undergo theſe gentle corrections, the curate diſcourſes the offenders in a mild friendly manner; and endeavours to excite in them a due ſenſe of their crime, and of the ill conſequences that might flow from it, and to convince them that they merit a much greater puniſhment than is inflicted. This mild treatment prevents tumults and inſurrections, and acquires the curates univerſal veneration and eſteem. The alcaldes are choſen annually by the regidores. The governor, regidores, and alcaldes are all Indians of the beſt capacities; and are in effect only ſo many overſeers appointed by the curate, and dignified with theſe empty titles (c).

Every town has its armory or magazine, in which are lodged the fire-arms or other weapons wherewith the militia are armed when they take the field to repel the irruptions of the Portugueſe and wild Indians. The militia are very dexterous and expert in the management of their arms; and are exerciſed on the eves of feſtivals in the ſquares or public places of the towns. The militia is compoſed of all thoſe who are able to bear arms: they are formed into companies, which have each a proper number of officers choſen from amongſt thoſe who are moſt diſtinguiſhed for judgment and conduct. The dreſs of the officers is rich, adorned with gold and ſilver, and the device of the town to which they belong: they always appear in their uniforms on feſtivals, and on the days of military exerciſe. The governor, alcaldes, and regidores have alſo proper robes and dreſſes ſuitable to their reſpective offices, in which they appear on public occaſions. There are ſchools in every town, in which the common people are taught reading and writing, and alſo muſic and dancing; in which arts they become very ſkilful. The Jeſuits are very careful in conſulting the natural bent and genius of their ſcholars, and in directing their ſtudies and application accordingly.

(c) We call them *empty titles*; becauſe in all cauſes the Jeſuit or curate of the pariſh was a kind of ſovereign regarded as a petty prince, and obeyed as an oracle. Whatever forms might take place in the choice of the chiefs of the ſeveral departments, their ſucceſs ultimately depended on him. The cacique held of him; the general received his commiſſion and inſtructions from him; and all his deciſions were without appeal. There were, we are informed, not leſs than 6000 pariſhes on the banks of the rivers Uruguay and Parana, not exceeding the diſtance of 30 miles from each other; in each of which was a Jeſuit or curate.

The lads of the moſt promiſing genius are taught the Latin tongue with great ſucceſs. In one of the court-yards of every curate's houſe are various ſhops or workhouſes of painters, carvers, gilders, ſilverſmiths, carpenters, weavers, and clockmakers, and of ſeveral other mechanics and artizans, who daily work for the public under the direction of the coadjutors, and at the ſame time teach the youth their reſpective arts and occupations.

The churches are large, well built, finely decorated and enlightened, and not inferior to the richeſt in Peru. Each church has a choir of muſic, compoſed of inſtruments of all ſorts, and very good voices; ſo that divine ſervice is celebrated here with as much pomp and ſolemnity as in cathedrals: nor are the public proceſſions leſs ſplendid, eſpecially that of the hoſt; which, whenever it is carried abroad, is attended by the governor, alcaldes, and regidores, in their robes, and alſo by the militia in a body. The houſes of the Indians are as well built and as well furniſhed as moſt of the Spaniſh houſes in Peru. The greateſt part indeed have mud walls, others are built with brick, and ſome with ſtone, but all are covered with tiles. In every town there is a houſe where gunpowder is made, that they may never want it when they are obliged to take arms, and always have it ready to make artificial fire works on rejoicing days: for all feſtivals are here obſerved with as great ceremony and exactneſs as in the greateſt cities. Upon the proclamation of a new king of Spain, the governors, alcaldes, regidores, and officers of the militia, appear dreſſed in new robes and uniforms of a different faſhion from thoſe they wore before. There is a ſort of a convent in every town; in one part whereof are confined women of an ill life, and the other part is deſtined for the reception of married women who have no family, and who retire thither when their huſbands are abſent. For the maintenance of this houſe, and for the ſupport of orphans, and of old and infirm people, all the inhabitants of the town work two days in every week; and the profits of their labour, which is called *the labour of the community*, are ſet apart for this purpoſe. If the produce of this labour be more than is neceſſary for their ſubſiſtence, the ſurplus is laid out to buy ornaments for the churches, and clothes for the orphans and aged and infirm people; ſo that here are no beggars, nor any who want the neceſſaries of life. In ſhort, by the wiſe policy and prudent regulations of the Jeſuits, the whole community enjoys peace and happineſs.

“ The Guaranies are ſo profuſe and negligent, that the curates are obliged to take into their hands all their goods and ſtuffs as ſoon as they are manufactured and made ready for ſale; otherwiſe they would waſte and deſtroy them, and not be able to maintain themſelves. The Chiquitos, on the contrary, are diligent and frugal; ſo that the curates have no other trouble with them than the aſſiſting them in the diſpoſal of their goods, and procuring returns for them. For this purpoſe the ſociety keeps a factor or procurator at Santa Fé and Buenos Ayres, to whom the merchandiſe of the miſſions is ſent to be diſpoſed of; and theſe factors return the value to the fathers in ſuch ſorts of European commodities as are wanted. The goods of every town are kept ſeparate; and the royal taxes are taken out of them without any other diſcounts or allowances, ſave the ſtipends of the curates of the Guaranies and the penſions of the caciques. The fathers chooſe to manage the commerce of their ſubjects themſelves, leſt they ſhould contract vices by their communication with other people. In this reſpect the fathers are ſo careful, that they will not ſuffer any of the people of Peru, whether they be Spaniards, Meſtizos, or Indians, to enter into the territories of the miſſions. They ſay that the Indians are but juſt recovered from a barbarous and diſſolute way of life, and that their manners are now pure and innocent; but that if ſtrangers were ſuffered to come among them, the Indians would ſoon get acquainted with people of looſe lives: and as the Guaranies eſpecially are very prone to vice, wickedneſs, diſorder, and rebellion would ſoon be introduced; the ſociety would loſe all the ſouls they have converted; and their little republic would be utterly ſubverted. However, there are ſome who ſuſpect that theſe are all ſpecious pretences; and that the ſociety's real motive for prohibiting all intercourſe with ſtrangers, is the fear of rivals in the beneficial commerce of Paraguay, which is now entirely in their hands.”

Such is the account they themſelves have given us of their own conduct: but others have treated their characters with more ſeverity; accuſing them of pride, haughtineſs, and abuſing their authority to the greateſt degree; inſomuch that they would have cauſed the magiſtrates to be whipped in their preſence, and obliged perſons of the higheſt diſtinction within their juriſdiction to kiſs the hem of their garment, as the greateſt honour at which they could poſſibly arrive. To this might be added, the utter abolition of all ideas of property; which indeed was rendered uſeleſs by the general magazines and ſtorehouſes which they eſtabliſhed, and from which, together with the herds of cattle kept for the public uſe, they ſupplied the wants of individuals as occaſion required; yet ſtill it was objected to the character of the fraternity, that they poſſeſſed large property themſelves, and claimed the abſolute diſpoſal of the meaneſt effects in Paraguay. All manufactures belonged to them; every natural commodity was brought to them; and the treaſures annually remitted to the ſuperior of the order were thought to be a proof that zeal for religion was not the only motive by which they were influenced.

Beſides the parochial or provincial governments, there was a kind of ſupreme council, compoſed of an annual meeting of all the fathers, who concerted the meaſures neceſſary for promoting the common concerns of the miſſion, framed new laws, corrected or aboliſhed old ones, and, in a word, adapted every thing to circumſtances. It is ſaid to have been one of the great objects of the annual councils to take ſuch meaſures as ſhould effectually deprive ſtrangers of all intelligence concerning the ſtate of the miſſion. Hence the natives were reſtrained from learning the Spaniſh tongue, and were taught, that it was dangerous for their ſalvation to hold any converſation with a ſubject of Spain or Portugal. But the circumſtance that rendered their deſigns moſt ſuſpicious, was the eſtabliſhment of a military force. Every pariſh had its corps of horſe and foot, who were duly exerciſed every Sunday; and it was ſaid, that the whole amounted to a body of 70,000 or 80,000 troops, well diſciplined.

Such was the ſtate of this country ſome time ago; but as to its ſituation ſince the abolition of the ſect of Jeſuits we can ſay nothing, as very little authentic intelligence is permitted to paſs from that country to this.

PARALIPOMENA, in matters of literature, denotes a ſupplement of things omitted in a preceding work.

PARALEPSIS. See ORATORY, N° 87.

PARALLACTIC, in general, ſomething relating to the parallax of heavenly bodies. See PARALLAX.

PARALLAX, in aſtronomy, is the difference between the places of any celeſtial object as ſeen from the ſurface, and from the centre of the earth at the ſame inſtant.

1 Illuſtration.

Let E in figure of parallax, Plate CCCLXXVI. repreſent the centre of the earth, O the place of an obſerver on its ſurface, whoſe viſible horizon is OH, and true horizon EF: Now let ZDT be a portion of a great circle in the heavens, and A the place of any object in the viſible horizon; join EA, and produce it to C; then C is the *true* place of the object, and H is its *apparent* place, and the angle CAH is the parallax; or, becauſe the object is in the horizon, it is called the *horizontal parallax*. But OAE, the angle which the earth's radius ſubtends at the object, is equal to CAH: Hence the horizontal parallax of an object may be defined to be the angle which the earth's ſemidiameter ſubtends at that object. For the various methods hitherto propoſed to find the quantity of the horizontal parallax of an object, ſee ASTRONOMY, N° 384—399 incluſive.

The whole effect of parallax is in a vertical direction: For the parallactic angle is in the plane paſſing through the obſerver and the earth's centre; which plane is neceſſarily perpendicular to the horizon, the earth being conſidered a ſphere.

2 The parallax decreaſes with the diſtance of the object from the zenith.

The more elevated an object is above the horizon, the leſs is the parallax, its diſtance from the earth's centre continuing the ſame. When the object is in the zenith, it has no parallax; but when in the horizon, its parallax is greateſt. The horizontal parallax being given, the parallax at any given altitude may be found by the following rule:

3 The ſine of the parallax in alt. is to the ſine of the hor. par. as the coſine of apparent altitude to the radius.

To the logarithmic coſine of the given altitude, and the log. ſine of the horizontal parallax, the ſum rejecting 10 from the index, will be the log. ſine of the parallax in altitude.

Demonſtration. Let B be the place of an object produce OB, ED to F and D; then the angle BOZ will be the apparent altitude of the object, BEZ the true altitude, and OBE the parallax in altitude. Now in the triangle AOE,

R : ſine OAE : : EA : EO.

And in the triangle OBE

BE (=EA) : EO : : ſine BOE : ſine OBE.

Hence R : coſine BOA : : ſine OAE : ſine OBE.

As the two laſt terms are generally ſmall quantities, the arch may be ſubſtituted in place of its ſine without any ſenſible error.

Example. Let the apparent altitude of the moon's centre be 39° 25′, and the moon's horizontal parallax 56′ 54″. Required the parallax in altitude.

Moon's apparent alt.	39° 25′	coſine	9.8879260
Moon's horizontal par.	56′ 54″	ſine	8.2188186
Moon's par. in altitude	43′ 57″	ſine	8.1067446

As the apparent place of an object is nearer the horizon than its true place, the parallax is therefore to be added to the apparent altitude, to obtain the true altitude. Hence alſo an object will appear to riſe later and ſet ſooner.

4 The ſine of the parallax of an object in the inverſe ratio of its diſtance from the earth's centre.

The ſine of the parallax of an object is inverſely as its diſtance from the earth's centre.

Demonſtration. Let A be the place of an object, and H the place of the ſame object at another time, or that of another object at the ſame inſtant; join EH, then in the triangles AOE, HOE.

R : ſine OAE : : AE : OE

ſine OHE : R : : OE : EH

Hence ſine OHE : ſine OAE : : AE : EH.

5 Parallax increaſes the apparent diſtance of an object from the meridian.

The parallax of an object makes it appear more diſtant from the meridian than it really is.

Demonſtration. The true and apparent places of an object are in the ſame vertical, the apparent place being lower than the true; and all verticals meet at the zenith: Hence the apparent place of an object is more diſtant from the plane of the meridian than the true place.

6 Parallax in longitude latitude, right aſcenſion, and declination.

The longitude, latitude, right aſcenſion, and declination of an object are affected by a parallax. The difference between the true and apparent longitudes is called the *parallax in longitude*; in like manner, the difference between the true and apparent latitudes, right aſcenſions, and declinations, are called the *parallax in latitude, right aſcenſion*, and *declination*, reſpectively.—When the object is in the nonageſimal, the parallax in longitude is nothing, but that in latitude is greateſt: and when the object is in the meridian, the parallax in right aſcenſion vaniſhes, and that in declination is a maximum. The apparent longitude is greater than the true longitude, when the object is eaſt of the nonageſimal, otherwiſe leſs; and when the object is in the eaſtern hemiſphere, the apparent right aſcenſion exceeds the true, but is leſs than the true right aſcenſion when the object is in the weſtern hemiſphere. The apparent place of an object is more diſtant from the elevated poles of the ecliptic and equator than the true place: hence, when the latitude of the place and elevated pole of the ecliptic are of the ſame name, the apparent latitude is leſs than the true latitude, otherwiſe greater; and the apparent declination will be leſs or greater than the true declination, according as the latitude of the place, and declination of the object, are of the ſame or of a contrary denomination.

The parallaxes in longitude, latitude, right aſcenſion, and declination, in the ſpheroidal hypotheſis, may be found by the following formulæ; in which *L* repreſents the latitude of the place, diminiſhed by the angle contained between the vertical and radius of the given place; *P* the horizontal parallax for that place; *a* the altitude of the nonageſimal at the given inſtant; *d* the apparent diſtance of the object from the nonageſimal; *l* λ the true and apparent latitudes of the object; *D* δ the true and apparent declinations reſpectively; and *m* its apparent diſtance from the meridian.

Then par. in long. = P. ſine *a*. ſine *d*. ſecant *l*, to radius unity; and par. in lat. = P. coſine *a*, coſine λ ∓ *p*. coſine *d*. ſine *a*. ſine λ.

The ſign — is uſed when the apparent diſtance of the object from the nonageſimal and from the elevated pole of the ecliptic are of the ſame affection, and the ſign + if of different affection. If the greateſt preciſion be required, the following quantity 0.000000121216 par. long.^{2}, ſine 2 *l*, is to be applied to the parallax in latitude found as above, by addition or ſubtraction, according as the true diſtance of the object from the elevated pole of the ecliptic is greater or leſs than 90°.

Again, par. in right aſcen. = P. coſine L. ſine *m*. ſecant D, to radius unity: and par. in declination = P. ſine L. coſine $\delta \mp$ P. coſine L. ſine δ, coſine *m*.

The upper or lower ſign is to be uſed, according as the diſtance of the object from the meridian and from the elevated pole of the equator are of the ſame or different affection. Part 2d. of par. in declination = 0.000000121216 par. in right aſcen.^{2}, ſine 2 D; which is additive to, or ſubtractive from, part firſt of parallax in declination, according as the true diſtance of the object from the elevated pole of the equator is greater or leſs than 90°. For the moon's parallax ſee Astronomy, N° 384 and 385. There is alſo a curious paper in the firſt volume of Aſiatic Reſearches, p. 320, &c. on the ſame ſubject, to which we refer our readers.

Parallax of the Earth's annual Orbit, is the difference between the places of a planet as ſeen from the ſun and earth at the ſame inſtant. The difference between the longitudes of the planet as ſeen from the ſun and earth is called the *parallax in longitude*; and the difference between its latitudes is the *parallax in latitude*.

Parallax, is alſo uſed to denote the change of place in an object ariſing from viewing it obliquely with reſpect to another object. Thus the minute hand of a watch is ſaid to have a parallax when it is viewed obliquely; and the difference between the inſtants ſhown by it, when viewed directly and obliquely, is the quantity of parallax in time.

PARALLEL, in geometry, an appellation given to lines, ſurfaces, and bodies, everywhere equidiſtant from each other. See Geometry.

Parallel Sphere, that ſituation of the ſphere wherein the equator coincides with the horizon, and the poles with the zenith and nadir.

Parallel Sailing. See Navigation, Book I. Chap. iv. p. 689.

Parallels of Latitude, in aſtronomy, are leſſer circles of the ſphere parallel to the ecliptic, imagined to paſs through every degree and minute of the colures.

Parallels of Altitude, or *Almucantars*, are circles parallel to the horizon, imagined to paſs through every degree and minute of the meridian between the horizon and zenith, having their poles in the zenith.

Parallels of Declination, in aſtronomy, are the ſame with parallels of latitude in geography.

PARALLELOPIPED, in geometry, a regular ſolid comprehended under ſix parallelograms, the oppoſite ones whereof are ſimilar, parallel, and equal to each other.

PARALLELOPIPEDIA, in natural hiſtory, a genus of ſpars, externally of a determinate and regular figure, always found looſe, detached, and ſeparate from all other bodies, and in form of an oblique parallelopiped, with ſix parallelogram ſides and eight ſolid angles; eaſily fiſſile either in a horizontal or perpendicular direction; being compoſed of numbers of thin plates, and thoſe very elegantly and regularly arranged bodies, each of the ſame form with the whole maſs, except that they are thinner in proportion to their horizontal planes, and naturally fall into theſe and no other figures, on being broken with a ſlight blow.

PARALOGISM, in logic, a falſe reaſoning, or a fault committed in demonſtration, when a conſequence is drawn from principles that are falſe; or, though true, are not proved; or when a propoſition is paſſed over that ſhould have been proved by the way.

PARALYSIS, the Palsy. See Medicine, N° 265.

PARAMECIA, in natural hiſtory, a name given to ſuch animalcules as have no viſible limbs or tails, and are of an irregularly oblong figure.

PARAMOUNT, (compounded of two French words, *par*, i. e. *per*, and *monter*, *aſcendere*), ſignifies in our law the "higheſt lord of the fee, of lands, tenements, and hereditaments." As there may be a lord meſne where lands are held of an inferior lord, who holds them of a ſuperior under certain ſervices; ſo this ſuperior lord is lord *paramount*. Alſo the king is the chief lord, or lord *paramount* of all the lands in the kingdom. *Co. Lit.* 1.

PARANYMPH, among the ancients, the perſon who waited on the bridegroom, and directed the nuptial ſolemnities; called alſo *pronubus* and *auſpex*, becauſe the ceremonies began by taking auſpicia. As the paranymph officiated only on the part of the bridegroom, a woman called *pronuba* officiated on the part of the bride.

PARAPET, in fortification, an elevation of earth deſigned for covering the ſoldiers from the enemy's cannon or ſmall ſhot. See Fortification.

PARAPHERNALIA, or Parapherna, in the civil law, thoſe goods which a wife brings her huſband beſides her dower, and which are ſtill to remain at her diſpoſal excluſive of her huſband, unleſs there is ſome proviſion made to the contrary in the marriage contract. Some of our Engliſh civilians define the paraphernalia to be ſuch goods as a wife challengeth over and above her dower or jointure, after her huſband's death; as furniture for her chamber, wearing apparel, and jewels, which are not to be put into the inventory of her huſband's goods; and a French civilian calls paraphernalia the moveables, linen, and other female neceſſaries, which are adjudged to a wife in prejudice of the creditors, when ſhe renounces the ſucceſſion of her huſband.

PARAPHIMOSIS, a diſorder of the penis, wherein the prepuce is ſhrunk, and withdrawn behind the glans, ſo as not to be capable of being brought to cover the ſame; which generally happens in venereal diſorders. See Surgery.

PARAPHRASE, an explanation of ſome text in clearer and more ample terms, whereby is ſupplied what the author might have ſaid or thought on the ſubject. Such are eſteemed Eraſmus's Paraphraſe on the New Teſtament, the Chaldee Paraphraſe on the Pentateuch, &c.

PARAPHRENITIS, an inflammation of the diaphragm. See Diaphragm, and *Index to Medicine*.

PARAPHROSYNE, a word uſed by medical writers to denote a delirium, or an alienation of mind in fevers, or from whatever other cauſe.

PARAPLEGIA,

PAPER MILL.

Plate CCCLXXVI.

Fig. 1.

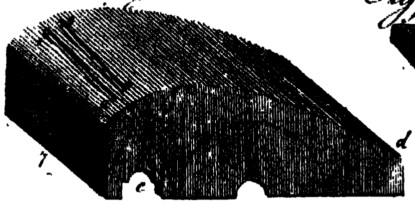


Fig. 2.

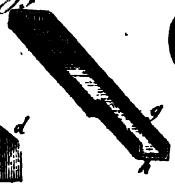


Fig. 4.

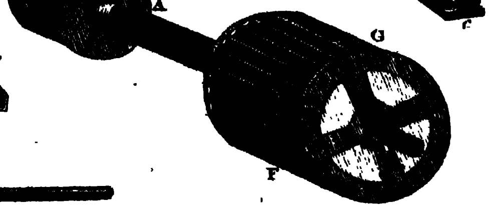


Fig. 5.

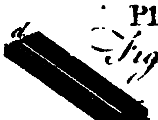


Fig. 6.

Fig. 11.

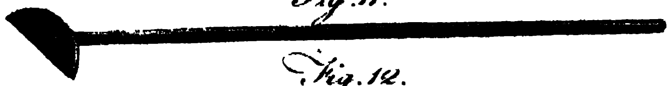


Fig. 12.

Fig. 9.

Fig. 8.

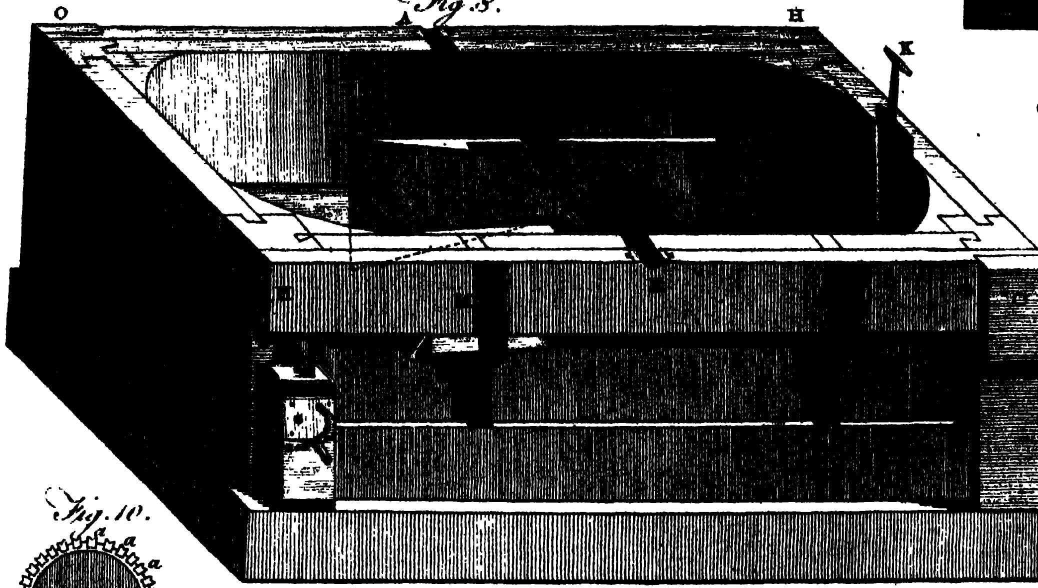


Fig. 7.

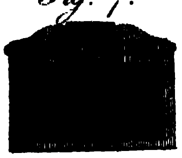
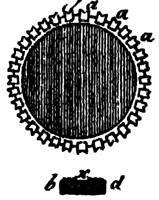
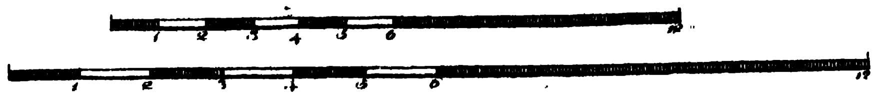
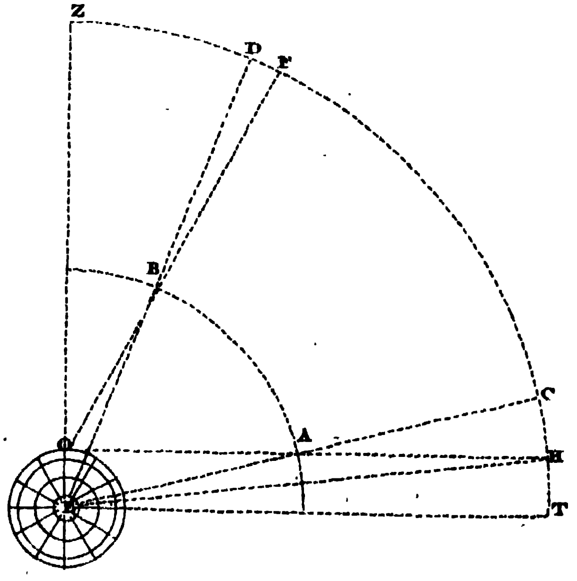


Fig. 10.





Parallax.



A. Bell Prin. H. M. Sculptor fecit.

PARAPLEGIA, a ſpecies of palſy. See MEDICINE, N° 268.

PARASANG, an ancient Perſian meaſure, different at different times, and in different places; being uſually 30, ſometimes 40, and ſometimes 50 ſtadia, or furlongs.—The word, according to Littleton, has its riſe from *paraſch angarius, q. d.* the ſpace a poſtman rides from one ſtation, *angaria*, to another.

PARASCENIUM, in the Grecian and Roman theatres, was a place behind the ſcenes whither the actors withdrew to dreſs and undreſs themſelves. The Romans more frequently called it *Poſtſcenium*. See THEATRE.

PARASELENE, in natural philoſophy, a mock moon; a meteor or phenomenon encompaſſing or adjacent to the moon, in form of a luminous ring; wherein are obſerved ſometimes one and ſometimes two or more images of the moon.

PARASEMON, among the Greeks, was the figure carved on the prow of the ſhips to diſtinguiſh them from each other. This figure was generally that of a bull, lion, or other animal; ſometimes the repreſentation of a mountain, tree, flower, &c.

PARASITE, among the Greeks, was originally a very reputable title; the paraſites being a kind of prieſts, at leaſt miniſters, of the gods, in the ſame manner as the epulones were at Rome. They took care of the ſacred corn, or the corn deſtined for the ſervice of the temples and the gods, viz. ſacrifices, feaſts, &c. They had even the intendance over ſacrifices; and took care that they were duly performed. At Athens there was a kind of college of 12 paraſites; each people of Attica furniſhing one, who was always choſen out of the beſt families. Polybius adds, that a paraſite was alſo an honourable title among the ancient Gauls, and was given to their poets. But of late it has been made a term of reproach, and uſed for a flatterer or mean dependent.

PARASITES, or *PARASITICAL Plants*, in botany, ſuch plants as are produced out of the trunk or branches of other plants, from whence they receive their nouriſhment, and will not grow on the ground. Such are the miſletoe, &c.

PARASTATÆ, in anatomy. See PROSTATE.

PARATALASSIA. See PRIMORIE.

PARBUNCLE, in a ſhip, the name of a rope almoſt like a pair of ſlings: it is ſeized both ends together, and then put almoſt double about any heavy thing that is to be hoiſted in or out of the ſhip; having the hook of the runner hitched into it, to hoiſt it up by.

PARCÆ, in heathen mythology, goddeſſes who were ſuppoſed to preſide over the accidents and events, and to determine the date or period, of human life.

The Parcæ were three, Clotho, Lacheſis, and Atropos; becauſe, forſooth, all things have their beginning, progreſs, and end. Hence the poets tell us, the Parcæ ſpun the thread of men's lives; that Clotho held the diſtaff, and drew the thread; Lacheſis twirled the ſpindle, and ſpun it; and Atropos cut it. *Clotho colum retinet, Lacheſis net, Atropos occat.*

The ancients repreſent the Parcæ divers ways: Lucian, in the ſhape of three poor old women, having large locks of wool, mixed with daffodils on their heads; one of which holds a diſtaff, the other a wheel, and the third a pair of ſciſſars, wherewith to cut the thread of life. Others repreſent them otherwiſe: Clotho appearing in a long robe of divers colours, wearing a crown upon her head adorned with ſeven ſtars, and holding a diſtaff in her hand: Lacheſis in a robe beſet with ſtars, with ſeveral ſpindles in her hand; and Atropos, clad in black, cutting the thread with a pair of large ſciſſars.

The ancients imagined that the Parcæ uſed white wool for a long and happy life, and black for a ſhort and unfortunate one. See *Neceſſity* in MYTHOLOGY.

PARCHMENT, the ſkins of ſheep or goats prepapared after ſuch a manner as to render it proper for writing upon, covering books, &c.

The word comes from the Latin *pergamena*, the ancient name of this manufacture; which is ſaid to have been taken from the city Pergamos, to Eumenes king whereof its invention is uſually aſcribed; though, in reality, that prince appears rather to have been the improver than the inventor of parchment. For the Perſians of old, according to Diodorus, wrote all their records on ſkins; and the ancient Ionians, as we are told by Herodotus, made uſe of ſheep ſkins and goat ſkins in writing, many ages before Eumenes's time. Nor need we doubt that ſuch ſkins were prepared and dreſſed for that purpoſe, after a manner not unlike that of our parchment; though probably not ſo artificially.—The manufacture of parchment is begun by the ſkinner, and finiſhed by the parchment maker.

The ſkin having been ſtripped of its wool, and placed in the lime pit, in the manner deſcribed under the article SHAMMY, the ſkinner ſtretches it on a kind of frame, and pares off the fleſh with an iron inſtrument; this done, it is moiſtened with a rag; and powdered chalk being ſpread over it, the ſkinner takes a large pumice ſtone, flat at bottom, and rubs over the ſkin, and thus ſcours off the fleſh; he then goes over it again with an iron inſtrument, moiſtens it as before, and rubs it again with the pumice ſtone without any chalk underneath: this ſmooths and ſoftens the fleſh ſide very conſiderably. He then drains it again, by paſſing over it the iron inſtrument as before. The fleſh ſide being thus drained, by ſcraping off the moiſture, he in the ſame manner paſſes the iron over the wool or hair ſide: then ſtretches it on a frame, and ſcrapes the fleſh ſide again: this finiſhes its draining; and the more it is drained the whiter it becomes. The ſkinner now throws on more chalk, ſweeping it over with a piece of lamb ſkin that has the wool on; and this ſmooths it ſtill farther. It is now left to dry, and when dried, taken off the frame by cutting it all round. The ſkin thus far prepared by the ſkinner, is taken out of his hands by the parchment maker, who firſt, while it is dry, pares it on a ſummer, (which is a calf ſkin ſtretched in a frame), with a ſharper inſtrument than that uſed by the ſkinner; and working with the arm from the top to the bottom of the ſkin, takes away about one half of its thickneſs. The ſkin thus equally pared on the fleſh ſide, is again rendered ſmooth, by being rubbed with the pumice ſtone, on a bench covered with a ſack ſtuffed with flocks; which leaves the parchment in a condition fit for writing upon. The parings thus taken off the leather, are uſed in making glue, ſize, &c. See the article GLUE, &c.

What is called *vellum* is only parchment made of the ſkins of abortives, or at leaſt ſucking calves. This has a much finer grain, and is whiter and ſmoother than parchment; but is prepared in the ſame manner, except its not being paſſed through the lime pit.

PARDALIS, in natural hiſtory. See FELIS.

PARDIES (Ignatius Gaſton), an ingenious and learned French Jeſuit, born at Paris in 1636. He taught polite literature for ſeveral years; during which time he compoſed ſeveral ſmall pieces, both in proſe and verſe, with peculiar delicacy of thought and ſtyle. At length he devoted himſelf entirely to mathematics and natural philoſophy, and read all authors, ancient as well as modern, in thoſe branches of knowledge. He died in 1673, of an infectious diſorder contracted by confeſſing and preaching to the priſoners in the Bicetre during the Eaſter holidays. Father Pardies publiſhed ſeveral works; of which his Elements of Geometry are well known in this country, where a tranſlation of them has gone through ſeveral editions. In 1672 he had a diſpute with Sir Iſaac Newton reſpecting his Theory of Light and Colours; which may be ſeen in the Philoſophical Tranſaction for that year.

PARDON, in criminal law, is the remitting or forgiving an offence committed againſt the king.

Beccaria on Crimes and Puniſhments.

Law (ſays an able writer), cannot be framed on principles of compaſſion to guilt; yet juſtice, by the conſtitution of England, is bound to be adminiſtered in mercy: this is promiſed by the king in his coronation oath; and it is that act of his government which is the moſt perſonal and moſt entirely his own. The king condemns no man; that rugged taſk he leaves to his courts of juſtice: the great operation of his ſceptre is mercy. His power of pardoning was ſaid by our Saxon anceſtors to be derived *à lege ſuæ dignitatis:* and it is declared in parliament, by ſtat. 27 Hen. VIII. c. 24. that no other perſon hath power to pardon or remit any treaſon or felonies whatſoever; but that the king hath the whole and ſole power thereof, united and knit to the imperial crown of this realm.

This is indeed one of the great advantages of monarchy in general above any other form of government, that there is a magiſtrate who has it in his power to extend mercy wherever he thinks it is deſerved; holding a court of equity in his own breaſt, to ſoften the rigour of the general law, in ſuch criminal caſes as merit an exemption from puniſhment. Pardons (according to ſome theoriſts) ſhould be excluded in a perfect legiſlation, where puniſhments are mild, but certain; for that the clemency of the prince ſeems a tacit diſapprobation of the laws. But the excluſion of pardons muſt neceſſarily introduce a very dangerous power in the judge or jury; that of conſtruing the criminal law by the ſpirit inſtead of the letter; or elſe it muſt be holden, what no man will ſeriouſly avow, that the ſituation and circumſtances of the offender (though they alter not the eſſence of the crime) ought to make no diſtinction in the puniſhment. In democracies, however, this power of pardon can never ſubſiſt; for there nothing higher is acknowledged than the magiſtrate who adminiſters the laws: and it would be impolitic for the power of judging and of pardoning to centre in one and the ſame perſon. This (as the Preſident Monteſquieu obſerves) would oblige him very often to contradict himſelf, to make and to unmake his deciſions: it would tend to confound all ideas of right among the maſs of people; as they would find it difficult to tell, whether a priſoner were diſcharged by his innocence, or obtained a pardon through favour. In Holland, therefore, if there be no ſtadtholder, there is no power of pardoning lodged in any other member of the ſtate. But in monarchies the king acts in a ſuperior ſphere; and though he regulates the whole government as the firſt mover, yet he does not appear in any of the diſagreeable or invidious parts of it. Whenever the nation ſee him perſonally engaged, it is only in works of legiſlature, munificence, or compaſſion. To him therefore the people look up as the fountain of nothing but bounty and grace; and theſe repeated acts of goodneſs, coming immediately from his own hand, endear the ſovereign to his ſubjects, and contribute more than any thing to root in their hearts that filial affection and perſonal loyalty which are the ſure eſtabliſhment of a prince.

The king may pardon all offences merely againſt the crown or the public; excepting, 1. That, to preſerve the liberty of the ſubject, the committing any man to priſon out of the realm, is by the *habeas corpus* act, 31 Car. II. c. 2. made a *præmunire*, unpardonable even by the king. Nor, 2. can the king pardon, where private juſtice is principally concerned in the proſecution of offenders: *Non poteſt rex gratiam facere cum injuria et damno aliorum.* Therefore, in appeals of all kinds (which are the ſuit, not of the king, but of the party injured), the proſecutor may releaſe; but the king cannot pardon. Neither can he pardon a common nuiſance, while it remains unredreſſed, or ſo as to prevent an abatement of it; though afterwards he may remit the fine: becauſe though the proſecution is veſted in the king to avoid the multiplicity of ſuits, yet (during its continuance) this offence ſavours more of the nature of a *private* injury to each individual in the neighbourhood, than of a *public* wrong. Neither, laſtly, can the king pardon an offence againſt a popular or penal ſtatute, after information brought; for thereby the informer hath acquired a private property in his part of the penalty.

There is alſo a reſtriction of a peculiar nature, that affects the prerogative of pardoning, in caſe of parliamentary impeachments, viz. that the king's pardon cannot be pleaded to any ſuch impeachment, ſo as to impede the inquiry, and ſtop the proſecution of great and notorious offenders. Therefore, when, in the reign of Charles II. the earl of Danby was impeached by the houſe of commons of high treaſon and other miſdemeanors, and pleaded the king's pardon in bar of the ſame, the commons alleged, "That there was no precedent that ever any pardon was granted to any perſon impeached by the commons of high treaſon, or other high crimes, depending the impeachment;" and thereupon reſolved, "That the pardon ſo pleaded was illegal and void, and ought not to be allowed in bar of the impeachment of the commons of England:" for which reſolution they aſſigned this reaſon to the houſe of lords, "That the ſetting up a pardon to be a bar of an impeachment defeats the whole uſe and effect of impeachments: for ſhould this point be admitted, or ſtand doubted, it would totally diſcourage the exhibiting any for the future; whereby the chief inſtitution for the preſervation of the government would be deſtroyed." Soon after the Revolution, the commons renewed the ſame claim, and voted, "That a pardon is not pleadable in bar of an impeachment." And at length, it was enacted by the act of ſettlement, 12 & 13 W. III. c. 2. "That no pardon under the great ſeal of England ſhall be pleadable to an impeachment by the commons in parliament." But, after the impeachment has been ſolemnly heard and determined, it is not underſtood that the king's royal grace is farther reſtrained or abridged: for, after the impeachment and attainder of the ſix rebel lords in 1715, three of them were from time to time reprieved by the crown; and at length received the benefit of the king's moſt gracious pardon.

The effect of ſuch pardon by the king, is to make the offender a new man; to acquit him of all corporal penalties and forfeitures annexed to that offence for which he obtains his pardon; and not ſo much to reſtore his former, as to give him a new credit and capacity. But nothing can reſtore or purify the blood when once corrupted, if the pardon be not allowed till after attainder, but the high and tranſcendant power of parliament. Yet if a perſon attainted receives the king's pardon, and afterwards hath a ſon, that ſon may be heir to his father; becauſe the father being made a new man, might tranſmit new inheritable blood; though, had he been born before the pardon, he could never have inherited at all.

Such is the nature of pardons in this kingdom. Theſe, like other good things, may doubtleſs be abuſed; and if they are in any inſtance, their abuſe deſerves cenſure: but that in their nature they ſhould be counted abſurd, arbitrary, and deſtructive of morality, can, we ſuſpect, proceed from nothing but from the preſumptive petulance of modern reformers, or from the new ſyſtem of civil equality.

Godwin's Inquiry concerning Political Juſtice.

We are told, however, by a late champion for the Rights of Man, that "the very word to a reflecting mind is fraught with abſurdity. 'What is the rule that ought in all caſes to preſcribe to my conduct?' Surely juſtice: underſtanding by juſtice the greateſt utility of the whole maſs of things that may be influenced by my conduct. 'What then is clemency?' It can be nothing but the pitiable egotiſm of him who imagines he can do ſomething better than juſtice. 'Is it right that I ſhould ſuffer conſtraint for a certain offence?' The rectitude of my ſuffering muſt be founded in its tendency to promote the general welfare. He therefore that pardons me, iniquitouſly prefers the imaginary intereſt of an individual, and utterly neglects what he owes to the whole. He beſtows that which I ought not to receive, and which he has no right to give. 'Is it right, on the contrary, that I ſhould not undergo the ſuffering in queſtion? Will he, by reſcuing me from ſuffering, do a benefit to me, and no injury to others?' He will then be a notorious delinquent, if he allow me to ſuffer. There is indeed a conſiderable defect in this laſt ſuppoſition. If, while he benefits me, he do no injury to others, he is infallibly performing a public ſervice. If I ſuffered in the arbitrary manner which the ſuppoſition includes, the whole would ſuſtain an unqueſtionable injury in the injuſtice that was perpetrated. And yet the man who prevents this odious injuſtice, has been accuſtomed to arrogate to himſelf the attribute of clemency, and the apparently ſublime, but in reality tyrannical, name of forgiveneſs. For, if he do more than has been here deſcribed, inſtead of glory he ought to take ſhame to himſelf, as an enemy to the intereſt of human kind. If every action, and eſpecially every action in which the happineſs of a rational being is concerned, be ſuſceptible of a certain rule, then caprice muſt be in all caſes excluded: there can be no action, which if I neglect, I ſhall have diſcharged my duty; and, if I perform, I ſhall be entitled to applauſe."

Such is the reaſoning of this zealous democrat; reaſoning which, in our opinion, betrays want of feeling or ignorance of human nature. That human nature is ſuch as, in the aggregate, to need controul, no one who is acquainted with it will deny; and there appears to be no other method of controuling mankind but by general laws; and theſe laws may, through the natural imperfection of human affairs, be cruel in one caſe, where they are juſt in another. Caſes may likewiſe occur where the ſentence of the law, without its execution, will anſwer every purpoſe which could be expected from it: and where the execution of it would be extreme cruelty, though it might in ſtrict unfeeling language be called *juſtice*, becauſe in conformity with the letter of the law: Yet though ſuch caſes may and do often occur, it would indeed be abſurd to aboliſh any of thoſe laws which the ſecurity of civil ſociety has required; and therefore the only natural remedy againſt *legal injuſtice* is the *ſyſtem of pardons*.

Our author next goes on to trace the origin of pardons; and inſtead of a definite ſyſtem of law, we are told that it is neceſſary to have a court of reaſon, to which the deciſions of a court of law ſhall be brought for reviſal: a remedy apparently too vague and indeterminate to produce any laſting or good effect; and the propoſal of which reſults from ſuppoſing mankind more virtuous and more knowing than they really are. We are next led to conſider the abuſes of pardons: from whence our author would draw an argument for their abolition; a ſpecies of reaſoning unfair and unphiloſophical. He tells us, that the authority in this caſe is placed firſt in the judge, and next in the king and council. "Now (ſays he), laying aſide the propriety or impropriety of this particular ſelection, there is one grievous abuſe which ought to ſtrike the moſt ſuperficial obſerver. Theſe perſons with whom the principal truſt is repoſed, conſider their functions in this reſpect as a matter purely incidental, exerciſe them with ſupineneſs, and in many inſtances with the moſt ſcanty materials to guide their judgment. This grows in a conſiderable degree out of the very name of pardon, which implies a work of ſupererogatory benevolence."

Now it is obvious to remark, that pardons are in general granted in conſequence of an application from people who have more *than ſcanty materials to guide their judgments*, and on whoſe fidelity in relating the circumſtances of the caſe, confidence is placed or not according to their ſeveral characters. Our author next proceeds to the arbitrary character of pardons. "Such a ſyſtem (he ſays), to ſpeak it truly, is a lottery of death, in which each man draws his ticket for reprieve or execution, as undefinable accidents ſhall decide." The alluſion here to a lottery ticket is peculiarly unfortunate and indelicate, nor does the whole ſentence ſhow any great degree of candour. It is poſſible to define

Pardon.

a particular crime, and to annex a particular puniſhment to the commiſſion of it; but the nature of morality conſiſts not in the external action, but in the motives which prompted to it. Definite law cannot, however, always make this diſtinction; and after the ſentence of the law is pronounced, it comes to be conſidered whether there are any alleviating circumſtances in the caſe; and whether there are or not, muſt depend on the particulars or accidents of the caſe: and it is indeed impoſſible to ſuppoſe that theſe accidents could be previouſly defined; their nature does not admit of it. To particularize and define every mode of an action which imagination can conceive, or which experience has ſhown us may happen, would indeed be an Herculean labour; and we might literally ſay with the Apoſtle, *that the world could not contain the books that might be written.* We are, however, told, that "reaſon is a thouſand times more explicit and intelligible than law; and when we are accuſtomed to conſult her, the certainty of her deciſions would be ſuch, as men practiſed in our preſent courts are totally unable to conceive." Were reaſon, however, appointed to be appealed to in all caſes, and to be the final criterion, it would leave far greater room for villany than any mode at preſent in practice. *Reaſon* is a very uncertain and indefinite term, and may be made any thing, according to the circumſtances or paſſions of men. Our reforming neighbours the French have raiſed a ſtatue to *reaſon* and to *truth;* but what claim they have to either, Mr Godwin muſt himſelf decide.

We are next told that pardons are deſtructive to morality. "Another very important conſequence (ſays our author) grows out of the ſyſtem of pardons. A ſyſtem of pardons is a ſyſtem of unmitigated ſlavery. I am taught to expect a certain deſirable event, from what? From the clemency, the uncontrouled, unmerited kindneſs of a fellow mortal. Can any leſſon be more degrading? The puſillanimous ſervility of the man who devotes himſelf with everlaſting obſequiouſneſs to another, becauſe that other having begun to be unjuſt, relents in his career; the ardour with which he confeſſes the rectitude of his ſentence and the enormity of his deſerts, will conſtitute a tale that future ages will find it difficult to underſtand. What are the ſentiments in this reſpect that are alone worthy of a rational being? Give me that, and that only, which without injuſtice you cannot refuſe. More than juſtice it would be diſgraceful for me to aſk, and for you to beſtow. I ſtand upon the foundation of right. This is a title which brute force may refuſe to acknowledge, but which all the force in the world cannot annihilate. By reſiſting this plea you may prove yourſelf unjuſt, but in yielding to it you grant me but my due. If, all things conſidered, I be the fit ſubject of a benefit, the benefit is merited: merit in any other ſenſe is contradictory and abſurd. If you beſtow upon me unmerited advantage, you are a recreant from the general good. I may be baſe enough to thank you; but if I were virtuous, I ſhould condemn you. Theſe ſentiments alone are conſiſtent with true independence of mind. He that is accuſtomed to regard virtue as an affair of favour and grace, cannot be eminently virtuous. If he occaſionally perform an action of apparent kindneſs, he will applaud the generoſity of his ſentiments; and if he abſtain, he will acquit himſelf with the queſtion, 'May I not do what I will with my own?' In the ſame manner, when he is treated benevolently by another, he will in the firſt place be unwilling to examine ſtrictly into the reaſonableneſs of this treatment, becauſe benevolence, as he imagines, is not ſubject to any inflexibility of rule; and, in the ſecond place, he will not regard his benefactor with that erect and unembarraſſed mien, that complete ſenſe of equality, which is the only immoveable baſis of virtue and happineſs."

Paregories || Parent.

Such is Mr Godwin's concluſion on this ſubject; and we leave it with our readers to determine, whether his ſyſtem or that which we at preſent enjoy would be the more rigorous or unjuſt; or whether mankind are indeed arrived at that eminent pitch of virtue, as to diſdain every favour which they do not abſolutely merit. The Chriſtian religion ſpeaks a different language: but amidſt the rage of popular reform, its *ſmall ſtill voice* is unheard and neglected.

PAREGORIES, in pharmacy, medicines that aſſuage pain, otherwiſe called ANODYNES.

PAREIRA FLAVA, in the materia medica, a kind of oblong and large root brought from the Braſils.—It is certainly a diuretic of no mean character, and has done great ſervice in nephritic caſes. In pleuriſies and quinſies, it has been attended with more ſucceſs than almoſt any medicine we know of ſingly.

PARELCON, in grammar, a figure by which a word or ſyllable is added to the end of another.

PAREMBOLE, in rhetoric, a figure wherein ſomething relating to the ſubject is inſerted in the middle of a period. All the difference between the parembole and parentheſis, according to Voſſius, is, that the former relates to the ſubject in hand, whereas the latter is foreign to it.

PARENCHYMA, in anatomy, a term introduced by Eraſiſtratus, ſignifying all that ſubſtance which is contained in the interſtices betwixt the blood veſſels of the viſcera, which he imagined to be extravaſated and concreted blood.

PARENCHYMA of Plants. Grew applies the term *parenchyma* to the pith or pulp, or that inner part of a fruit or plant through which the juice is ſuppoſed to be diſtributed. See PLANTS.

PARENT, a term of relation applicable to thoſe from whom we immediately derive our being. See *MORAL Philoſophy*, N° 129 and 137.

To this article belongs an inquiry into, 1. The legal duties of parents to their legitimate children. 2. Their power over them.

I. The duties of parents to legitimate children conſiſt in three particulars; their *maintenance*, their *protection*, and their *education*.

Blackſt. Comment.

1. The duty of parents to provide for the *maintenance* of their children, is a principle of natural law; an obligation, ſays Puffendorff, laid on them not only by nature herſelf, but by their own proper act, in bringing them into the world; for they would be in the higheſt manner injurious to their iſſue, if they only gave their children life, that they might afterwards ſee them periſh. By begetting them, therefore, they have entered into a voluntary obligation, to endeavour, as far as in them lies, that the life which they have beſtowed ſhall be ſupported and preſerved. And thus

the children will have a perfect right of receiving maintenance from their parents. And the Preſident Monteſquieu has a very juſt obſervation upon this head, that the eſtabliſhment of marriage, in all civilized ſtates, is built on this natural obligation of the father to provide for his children; for that aſcertains and makes known the perſon who is bound to fulfil this obligation; whereas, in promiſcuous and illicit conjunctions, the father is unknown; and the mother finds a thouſand obſtacles in her way; ſhame, remorſe, the conſtraint of her ſex, and the rigour of laws, that ſtifle her inclinations to perform this duty; and beſides, ſhe generally wants ability.

The municipal laws of all well regulated ſtates have taken care to enforce this duty: though Providence has done it more effectually than any laws, by implanting in the breaſt of every parent that natural ϛοργη, or inſuperable degree of affection, which not even the deformity of perſon or mind, not even the wickedneſs, ingratitude, and rebellion of children, can totally ſuppreſs or extinguiſh.

The civil law obliges the parent to provide maintenance for his child; and if he refuſes, *judex de ea re cognoſcet*. Nay, it carries this matter ſo far, that it will not ſuffer a parent at his death totally to diſinherit his child, without expreſsly giving his reaſon for ſo doing; and there are 14 ſuch reaſons reckoned up, which may juſtify ſuch diſinheriſon. If the parent alleged no reaſon, or a bad, or a falſe one, the child might ſet the will aſide, *tanquam teſtamentum inofficioſum*, a teſtament contrary to the natural duty of the parent. And it is remarkable under what colour the children were to move for relief in ſuch a caſe; by ſuggeſting, that the parent had loſt the uſe of his reaſon when he made the *inofficious* teſtament. And this, as Puffendorff obſerves, was not to bring into diſpute the teſtator's power of diſinheriting his own offspring; but to examine the motives upon which he did it; and if they were found defective in reaſon, then to ſet them aſide. But perhaps this is going rather too far: every man has, or ought to have, by the laws of ſociety, a power over his own property: and, as Grotius very well diſtinguiſhes, natural right obliges to give a *neceſſary* maintenance to children; but what is more than that they have no right to, than as it is given by the favour of their parents, or the poſitive conſtitutions of the municipal law.

Let us next ſee what proviſion our own laws have made for this natural duty. It is a principle of law, that there is an obligation on every man to provide for thoſe deſcended from his loins; and the manner in which this obligation ſhall be performed, is thus pointed out. The father and mother, grandfather and grandmother, of poor impotent perſons, ſhall maintain them at their own charges, if of ſufficient ability, according as the quarter ſeſſions ſhall direct; and, if a parent runs away, and leaves his children, the church wardens and overſeers of the pariſh ſhall ſeize his rents, goods, and chattels, and diſpoſe of them towards their relief. By the interpretations which the courts of law have made upon theſe ſtatutes, if a mother or grandmother marries again, and was before ſuch ſecond marriage of ſufficient ability to keep the child, the huſband ſhall be charged to maintain it; for this being a debt of her's, when ſingle, ſhall, like others, extend to charge the huſband. But, at her death, the relation being diſſolved, the huſband is under no farther obligation.

No perſon is bound to provide a maintenance for his iſſue, unleſs where the children are impotent and unable to work, either through infancy, diſeaſe, or accident; and then is only obliged to find them with neceſſaries, the penalty on refuſal being no more than 20s. a month. For the policy of our laws, which are ever watchful to promote induſtry, did not mean to compel a father to maintain his idle and lazy children in eaſe and indolence; but thought it unjuſt to oblige the parent, againſt his will, to provide them with ſuperfluities, and other indulgences of fortune; imagining they might truſt to the impulſe of nature, if the children were deſerving of ſuch favours. Yet, as nothing is ſo apt to ſtifle the calls of nature as religious bigotry, it is enacted, that if any Popiſh parent ſhall refuſe to allow his Proteſtant child a fitting maintenance, with a view to compel him to change his religion, the lord chancellor ſhall by order of court conſtrain him to do what is juſt and reaſonable. But this did not extend to perſons of another religion, of no leſs bitterneſs and bigotry than the Popiſh: and therefore, in the very next year, we find an inſtance of a Jew of immenſe riches, whoſe only daughter having embraced Chriſtianity, he turned her out of doors; and on her application for relief, it was held ſhe was entitled to none. But this gave occaſion to another ſtatute, which ordains, that if Jewiſh parents refuſe to allow their Proteſtant children a fitting maintenance, ſuitable to the fortune of the parent, the lord chancellor, on complaint, may make ſuch order therein as he ſhall ſee proper.

Our law has made no proviſion to prevent the diſinheriting of children by will; leaving every man's property in his own diſpoſal, upon a principle of liberty in this as well as every other action; though perhaps it had not been amiſs if the parent had been bound to leave them at the leaſt a neceſſary ſubſiſtence. Indeed, among perſons of any rank or fortune, a competence is generally provided for younger children, and the bulk of the eſtate ſettled upon the eldeſt by the marriage articles. Heirs alſo, and children, are favourites of our courts of juſtice, and cannot be diſinherited by any dubious or ambiguous words; there being required the utmoſt certainty of the teſtator's intentions to take away the right of an heir.

2. From the duty of maintenance we may eaſily paſs to that of *protection*; which is alſo a natural duty, but rather permitted than enjoined by any municipal laws; nature, in this reſpect, working ſo ſtrongly as to need rather a check than a ſpur. A parent may, by our laws, maintain and uphold his children in their law-ſuits, without being guilty of the legal crime of maintaining quarrels. A parent may alſo juſtify an aſſault and battery in defence of the perſons of his children; nay, where a man's ſon was beaten by another boy, and the father went near a mile to find him, and there revenged his ſon's quarrel by beating the other boy, of which beating he afterwards unfortunately died; it was not held to be murder, but manſlaughter merely. Such indulgence does the law ſhow to the frailty of human nature, and the workings of parental affection.

3. The laſt duty of parents to their children is that

of giving them an *education* ſuitable to their ſtation in life: a duty pointed out by reaſon and of far the greateſt importance of any. For, as Puffendorff very well obſerves, it is not eaſy to imagine or allow, that a parent has conferred any conſiderable benefit upon his child by bringing him into the world, if he afterwards entirely neglects his culture and education, and ſuffers him to grow up like a mere beaſt, to lead a life uſeleſs to others, and ſhameful to himſelf. Yet the municipal laws of moſt countries ſeem to be defective in this point by not conſtraining the parent to beſtow a proper education upon his children. Perhaps they thought it puniſhment enough to leave the parent who neglects the inſtruction of his family, to labour under thoſe griefs and inconveniences which his family, ſo uninſtructed, will be ſure to bring upon him. Our laws though their defects in this particular cannot be denied, have in one inſtance made a wiſe proviſion for breeding up the riſing generation; ſince the poor and laborious part of the community, when paſt the age of nurture, are taken out of the hands of their parents, by the ſtatutes for apprenticing poor children; and are placed out by the public in ſuch a manner as may render their abilities, in their ſeveral ſtations, of the greateſt advantage to the commonwealth. The rich indeed are left at their own option, whether they will breed up their children to be ornaments or diſgraces to their family. Yet in one caſe, that of religion, they are under peculiar reſtrictions: for it is provided that if any perſon ſends any child under his government beyond the ſeas, either to prevent its good education in England, or in order to enter into, or reſide in, any Popiſh college, or to be inſtructed, perſuaded or ſtrengthened in the Popiſh religion; in ſuch caſe, beſides the diſabilities incurred by the child ſo ſent, the parent or perſon ſending ſhall forfeit 100l. which ſhall go to the ſole uſe and benefit of him that ſhall diſcover the offence. And if any parent, or other, ſhall ſend or convey any perſon beyond ſea, to enter into, or be reſident in, or trained up in, any priory, abbey, nunnery, Popiſh univerſity, college or ſchool, or houſe of Jeſuits or prieſts, or in any private Popiſh family in order to be inſtructed, perſuaded or confirmed, in the Popiſh religion; or ſhall contribute any thing towards their maintenance when abroad by any pretext whatever, the perſon both ſending and ſent ſhall be diſabled to ſue in law or equity, or to be executor or adminiſtrator to any perſon, or to enjoy any legacy or deed of gift, or to bear any office in the realm, and ſhall forfeit all his goods and chattels, and likewiſe all his real eſtate for life. See NONCONFORMISTS.

II. The *power* of parents over their children is derived from the former conſideration, their *duty;* this authority being given them, partly to enable the parent more effectually to perform his duty, and partly as a recompenſe for his care and trouble in the faithful diſcharge of it. And upon this ſcore the municipal laws of ſome nations have given a much larger authority to the parents than others. The ancient Roman laws gave the father a power of life and death over his children; upon this principle, that he who gave had alſo the power of taking away. But the rigour of theſe laws was ſoftened by ſubſequent conſtitutions: ſo that we find a father baniſhed by the emperor Hadrian for killing his ſon, though he had committed a very heinous crime; upon this maxim, that *patris poteſtas in pietate debet, non in atrocitate, conſiſtere.* But ſtill they maintained to the laſt a very large and abſolute authority: for a ſon could not acquire any property of his own during the life of his father; but all his acquiſitions belonged to the father, or at leaſt the profits of them for his life.

The power of a parent by the Engliſh law is much more moderate; but ſtill ſufficient to keep the child in order and obedience. He may lawfully correct his child, being under age, in a reaſonable manner: for this is for the benefit of his education. The conſent or concurrence of the parent to the marriage of his child under age, was alſo directed by our ancient law to be obtained: but now it is abſolutely neceſſary; for without it the contract is void. And this alſo is another means which the law has put into the parent's hands, in order the better to diſcharge his duty; firſt, of protecting his children from the ſnares of artful and deſigning perſons; and next of ſettling them properly in life, by preventing the ill conſequences of too early and precipitate marriages. A father has no other power over his ſon's eſtate, than as his truſtee or guardian: for though he may receive the profits during the child's minority, yet he muſt account for them when he comes of age. He may indeed have the benefit of his children's labour while they live with him and are maintained by him; but this is no more than he is entitled to from his apprentices or ſervants. The legal power of a father (for a mother, as ſuch, is entitled to no power, but only to reverence and reſpect), the power of a father, we ſay, over the perſons of his children ceaſes at the age of 21; for they are then enfranchiſed by arriving at years of diſcretion, or that point which the law has eſtabliſhed (as ſome muſt neceſſarily be eſtabliſhed) when the empire of the father, or other guardian, gives place to the empire of reaſon. Yet, till that age arrives, this empire of the father continues even after his death; for he may by his will appoint a guardian to his children. He may alſo delegate part of his parental authority, during his life, to the tutor or ſchoolmaſter of his child; who is then *in loco parentis*, and has ſuch a portion of the power of the parent committed to his charge, *viz.* that of reſtraint and correction, as may be neceſſary to anſwer the purpoſes for which he is employed.

In the Gentleman's Magazine for 1750, we have the following caſe of conſcience. "A perſon has his own parents and his own children living, both parties equally indigent, both equally incapable of aſſiſting themſelves, and both equally earneſt in calling upon him for relief. Things are ſo circumſtanced that he can poſſibly aſſiſt but one party, and not both. *Query*, Which party has the greateſt claim to his aſſiſtance, and to which is he obliged, by all ties human and divine, to give the preference?" One ſolves this difficulty, by informing us of a pretty print done at Rome, repreſenting a young woman ſuckling her aged father, on which the following lines are quoted.

My child and father vital nurture crave,
Parental, filial, fondneſs both would ſave;
But if a nurſling only one can live,
I chooſe to ſave the life I cannot give.

Here we find the preference given to the parent;

and another correſpondent gives the ſame deciſion in theſe words. "The obligations ariſing from nature, and natural affection, ſeem to be in this caſe reciprocal and equipollent: the child is as ſtrongly attracted to the parent, as the parent to the child. But will not filial gratitude operate and decide in favour of the parents? Does not the perſon, either mediately or immediately owe his preſent power and abilities to relieve, to his parents? and are not they on that account beſt entitled to relief? Does not the fifth commandment declare more ſtrongly in favour of the parents, than any other divine precept does in favour of the children? If a perſon had an opportunity given him of delivering either his parent or his child (but not both) from certain death, I dare ſay the voice of nature and of mankind would applaud him that ſaved his parent, and condemn him that ſhould prefer his child. There is more of ſelfiſhneſs in preferring the child; and to ſave the parent ſeems to me to be much the more generous, noble, and exalted conduct. It is indeed, upon the whole, a melancholy alternative; but if both parties continue importunate, and neither will relinquiſh their claims in favour of the other, I ſay relieve the parent." There are two correſpondents, however, who think differently, and their reaſons are as follow: "A perſon's children have the greateſt claim to his aſſiſtance, and he is obliged by all ties to prefer them, in that reſpect, to his parents. It is true, when a man's parents are in want, they have a claim to his aſſiſtance; but that claim is not equal to that which his children have. His parents he has of neceſſity: his children, of choice. It is his duty, before he beget children, to conſider how he is to provide for them: and by being wilfully the cauſe of their exiſtence, he comes under ſuch an obligation to provide for their comfortable ſubſiſtence, as muſt be ſtronger than any obligation of that kind he can be under to perſons with whom his connexion is involuntary. Both nature and reaſon point it out as the duty of all parents to provide for their children; but not *vice verſa*. If a man's parents happen to be indigent, and he himſelf able, he is bound to maintain them out of reſpect and gratitude: but his obligation to provide for his children is a debt of ſtrict juſtice; and therefore ought to be preferred. Nevertheleſs, the deſcription of the caſe to which the query is ſubjoined, is ſo general, that it is eaſy to figure a caſe according to that deſcription in which the perſon ought to prefer his parents. This obligation to provide for his children may have been diſſolved by monſtrous ingratitude, ſuch as their plotting againſt his life; or he may have given them proper education, and ample proviſions, which they have riotouſly ſquandered away: in either of which caſes it is thought he is undoubtedly diſcharged from his obligation. But if they have loſt their portions purely by misfortunes, without their fault, it is thought his obligation to aſſiſt them is not wholly extinguiſhed; and in that caſe there may be great reaſon to doubt whether their claim to his aſſiſtance, or that of his parents, is preferable: it is thought, however, the children's is preferable." "I find (ſays the author of the laſt anſwer) that all your correſpondents agree, that the life of the parent is to be preſerved. It is very certain, that the relation between me and my child is exactly equal to that which is between me and my parent; and therefore relation cannot decide in favour of the one or the other: I muſt then be determined by a different conſideration; and I know of none more weighty than the following. If I preſerve the life of my child, I am inſtrumental in giving life to all his deſcendants, which may, perhaps, be very numerous; but if I preſerve the life of my parent, I preſerve a ſingle life only, and that a ſhort one. I therefore ſay, *relieve the child*. But it is thought that the voice of nature will applaud the perſon who preſerves the parent: if ſo, nature muſt applaud a rule which ſhe herſelf does not obſerve: it is natural for old men to die before young ones. Beſides, the command, *Be fruitful and multiply, and repleniſh the earth*, may be oppoſed to the fifth commandment." Still, however, it is doubtleſs difficult to determine in ſuch caſes when they occur, as there are no fixed rules whereby to decide. With reſpect to the power of parents and the duty of children, much may be ſaid. There is, however, ſcarcely any inſtance where either are oftener abuſed than with reſpect to marriage. This, as it is the moſt important event in the civil life either of a man or woman, ſo it is often rendered peculiarly unfortunate, by precipitate folly and want of duty in children; and as often through the unreaſonable ſeverity of parents. As a child is bound not to give unreaſonable offence to a parent in the choice of a partner; ſo neither ought the parent to impoſe any improper or arbitrary reſtraint upon the child.

The power of a parent in China is very great; for a father, while living, has the power of an abſolute deſpotic tyrant, and after his death is worſhipped as a god. Let a ſon become ever ſo rich, and a father ever ſo poor, there is no ſubmiſſion, no point of obedience, that the latter cannot command, or that the former can refuſe. The father is abſolute maſter, not only of his ſon's eſtate, but alſo of his concubines and children, who, whenever, they diſpleaſe him, he may ſell to ſtrangers. If a father accuſes his ſon before a mandarin, there needs no proof of his guilt; for they cannot believe that any father can be ſo unnatural as to bring a falſe accuſation againſt his own ſon. But ſhould a ſon be ſo inſolent as to mock his father, or arrive at ſuch a pitch of wickedneſs as to ſtrike him, all the province where this ſhameful act of violence is committed is alarmed; it even becomes the concern of the whole empire; the emperor himſelf judges the criminal. All the mandarins near the place are turned out of their poſts, eſpecially thoſe of the town where he lived, for having been ſo negligent in their inſtructions; and all the neighbours are reprimanded for neglecting, by former puniſhments, to put a ſtop to the wickedneſs of the criminal before it arrived to ſuch flagitiouſneſs. As to the unhappy wretch himſelf, they cut him into a thouſand pieces, burn his bones, level his houſe to the ground, and even thoſe houſes that ſtand near it, and ſet up monuments and memorials of the horrid deed.

Payne's Geography.

The emperor of China, who is one of the moſt powerful and deſpotic monarchs upon earth, pays the greateſt attention to his mother. An inſtance of this Pere Amyot relates as having happened at Pekin, A. D. 1752, when the emperor's mother entered her 60th year, which, among the Chineſe, is accounted a very remarkable period. Groſier likewiſe particularly deſcribes the homage the emperor pays his mother every new-year's day in the palace, at which ceremony all the great officers of his court aſſiſt. See CHILDREN, *Filial Piety*, *Parental Affection*, &c.

PARENT (Unſoine), a mathematician, was born at Paris in 1666. He ſhowed an early propenſity to mathematics. He accuſtomed himſelf to write remarks upon the margins of the books which he read; and he had filled a variety of books with a kind of commentary at the early age of thirteen. At fourteen he was put under a maſter, who taught rhetoric at Chartres. It was here that he happened to ſee a dodecoëdron, upon every face of which was delineated a ſun dial, except the loweſt, whereon it ſtood. Struck as it were inſtantaneouſly with the curioſity of theſe dials, he attempted drawing one himſelf: but having a book which only ſhowed the practical part without the theory, it was not till after his rhetoric maſter came to explain the doctrine of the ſphere to him that he began to underſtand how the projection of the circles of the ſphere formed ſun dials. He then undertook to write a Treatiſe upon Gnomonics. The piece was indeed rude and unpoliſhed; but it was entirely his own, and not borrowed. About the ſame time he wrote a book of Geometry, in the ſame taſte, at Beauvois. His friends then ſent for him to Paris to ſtudy the law; and, in obedience to them, he ſtudied a courſe in that faculty: which was no ſooner finiſhed than, urged by his paſſion for mathematics, he ſhut himſelf up in the college of Dormans, that no avocation might take him from his beloved ſtudy: and, with an allowance of leſs than 200 livres a-year, he lived content in this retreat, from which he never ſtirred but to the Royal College, in order to hear the lectures of M. de la Hire or M. de Sauveur. When he found himſelf capable of teaching others, he took pupils: and fortification being a branch of mathematics which the war had brought into particular notice, he turned his attention to it; but after ſome time began to entertain ſcruples about teaching what he had never ſeen, and knew only by the force of imagination. He imparted this ſcruple to M. Sauveur, who recommended him to the Marquis d'Aligre, who luckily at that time wanted to have a mathematician with him. Parent made two campaigns with the marquis, by which he inſtructed himſelf ſufficiently in viewing fortified places; of which he drew a number of plans, though he had never learned the art of drawing. From this period he ſpent his time in a continual application to the ſtudy of natural philoſophy, and mathematics in all its branches, both ſpeculative and practical; to which he joined anatomy, botany, and chemiſtry. His genius managed every thing, and yet he was inceſſant and indefatigable in his application. M. de Billettes, who was admitted in the Academy of Sciences at Paris in 1699, with the title of their mechanician, nominated for his diſciple Parent, who excelled chiefly in this branch. It was ſoon diſcovered in this ſociety, that he engaged in all the various ſubjects which were brought before them; and indeed that he had a hand in every thing. But this extent of knowledge, joined to a natural impetuoſity of temper, raiſed in him a ſpirit of contradiction, which he indulged on all occaſions; ſometimes to a degree of precipitancy highly culpable, and often with but little regard to decency. Indeed the ſame behaviour was ſhown to him, and the papers which he brought to the academy were often treated with much ſeverity. He was charged with obſcurity in his productions; and he was indeed ſo notorious for this fault, that he perceived it himſelf, and could not avoid correcting it. The king had, by a regulation in 1716, ſuppreſſed the claſs of ſcholars of the academy, which ſeemed to put too great an inequality betwixt the members. Parent was made a joint or aſſiſtant member for geometry: but he enjoyed this promotion but a ſhort time; for he was taken off by the ſmallpox the ſame year, at the age of 50. He was author of a great many pieces, chiefly on mechanics and geometry.

PARENTAL, ſomething belonging to the relation of parent. See PARENT.

Parental Affection, the endearing attachment of parents to their children, including in it love; a deſire of doing good to thoſe who by an act of our own depend upon us for all that they enjoy. Nature even excites this affection in brutes: but in them it continues only ſo long as it is neceſſary for the preſervation of their offspring; for when theſe are able to provide for themſelves, it ceaſes, and the relation is forgotten. In man, however, though it leſſens, or at leaſt becomes leſs anxious as the dependence of the child becomes leſs, it never entirely ceaſes, except in ſome few inſtances of extreme depravity. Authors, however, have imagined, and Lord Kames's § among the reſt, that after the child is provided for, and no more depends on the parent, all affection would ceaſe, were it not artificially preſerved and confirmed by habit. Whether his lordſhip, in this opinion, be right or wrong, we ſhall not pretend to ſay. One thing, however, is certain, that be it natural or not, it is one of the greateſt comforts of life, even when all dependence has ceaſed. It matters not that there are many inſtances where this comfort is not felt. Human depravity has often obliterated the fineſt feelings of the mind; and it is not to be wondered at if in ſome inſtances it do ſo in the caſe before us. A good heart certainly can enjoy no greater ſatiſfaction than that ariſing from grateful returns of kindneſs and affection to an aged parent. As the vexations which parents receive from their children haſten the approach of age, and double the force of years; ſo the comforts which they reap from them are balm to all other ſorrows, and diſappoint the injuries of time. Parents repeat their lives in their offſprings; and their concern for them is ſo near, that they feel all their ſufferings, and taſte all their enjoyments, as much as if they regarded their own perſons. However ſtrong we may ſuppoſe the fondneſs of a father for his children, yet they will find more lively marks of tenderneſs in the boſom of a mother. There are no ties in nature to compare with thoſe which unite an affectionate mother to her children, when they repay her tenderneſs with obedience and love.

We have a remarkable inſtance of parental affection in Zaleucus ‡ prince of the Locrines; who made a decree, that whoever was convicted of adultery ſhould be puniſhed with the loſs of both his eyes. Soon after this eſtabliſhment, the legiſlator's own ſon was apprehended in the very fact, and brought to a public trial. How could the father acquit himſelf in ſo tender and delicate a conjuncture? Should he execute the law in all its rigour, this would be worſe than death

§ *Sketches of the Hiſtory of Man.*

‡ *Ælian.* Lib. 13.

death to the unhappy youth: ſhould he pardon ſo notorious a delinquent, this would defeat the deſign of his ſalutary inſtitution. To avoid both theſe inconveniences, he ordered one of his own eyes to be pulled out and one of his ſon's.

Diodorus Siculus alſo, lib. 34. gives us a ſurpriſing inſtance of the ſame warm affection. Cambalus, a young gentleman of character and fortune in the city of Mulgeatum, being one day out a-courſing, was way-laid, and very near being robbed and murdered by the banditti who infeſted that part of the country. Gorgus, the young gentleman's father, happened to come by at the very inſtant, to whom Cambalus related the danger he was in. The ſon was on foot, the father on horſeback; but no ſooner had he heard the melancholy tale, than he leapt from his horſe, deſired his ſon to mount, and make the beſt of his way into the city: but Cambalus, preferring his father's ſafety to his own, would by no means conſent to it; on the contrary, conjured his father to leave him, and take care of himſelf. The father, ſtruck with the generoſity and affection of his ſon, added tears to entreaties, but all to no purpoſe. The conteſt between them is better conceived than deſcribed—while bathed in tears, and beſeeching each other to preſerve his own life, the banditti approached and ſtabbed them both.

Amongſt the ancient Greeks, the ſentiments of parental affection were exceedingly ſtrong and ardent. The mutual tenderneſs of the huſband and the wife was communicated to their offspring; while the father viewed in his child the charms of its mother, and the mother perceived in it the manly graces of its father. As paternal kindneſs is the moſt ſimple and natural expanſion of ſelf-love, ſo there are innumerable inſtances of it in all countries ſavage and civilized.

PARENTALIA, in antiquity, funeral obſequies, or the laſt duties paid by children to their deceaſed parents.

PARENTHESIS, in grammar, certain intercalary words inſerted in a diſcourſe, which interrupt the ſenſe or thread, but ſeem neceſſary for the better underſtanding of the ſubject.

PARENZO, a ſmall but ſtrong town of Italy, and in Iſtria, with a biſhop's ſee and a good harbour; ſeated on the gulf of Venice, in E. Long. 13. 46. N. Lat. 39. 28. It ſubmitted to the Venetians in 1267.

PARESIS, in medicine, a palſy of the bladder, wherein the urine is either ſuppreſſed or diſcharged involuntarily.

PARETONEUM, in natural hiſtory, the name of an earth found on the ſhores of Egypt, Cyrene, and the iſland of Crete, uſed by the ancients in painting.

It had its name either from a port of Egypt, near which it was gathered, or from the name of a town in that kingdom, where it was uſually ſold. Vitruvius is of the firſt opinion, and Volaternus of the other. Of late it was thought to be loſt; but it is ſtill common on the ſhores of moſt of the iſlands of the Archipelago, though not obſerved or regarded; and is truly a very heavy and tough clay of a fine white colour, found in maſſes of different ſizes, generally as ſoft as the ſofter clays within the ſtrata; and, by rolling about on the beach in this ſtate, it gathers up the ſand, ſmall ſhells, and other foulneſſes, we always find about it. It is likely that there are ſtrata of it fine and pure in the cliffs there, and that the ſea waſhes off maſſes of them in ſtorms and high tides, which are what we find.

PARGET, in natural hiſtory, a name given to ſeveral kinds of gypſum, or plaſter ſtone.

PARGETING, in building, is uſed for the plaſtering of walls, and ſometimes for plaſter itſelf.

Pargeting is of various kinds: as, 1. White lime and hair mortar laid on bare walls. 2. On bare laths, as in partitioning and plain ceiling. 3. Rendering the inſides of walls, or doubling partition walls. 4. Rough-caſting on heart laths. 5. Plaſtering on brick work, with finiſhing mortar, in imitation of ſtone work; and the like upon heart laths.

PARHELION, or PARHELIUM, formed from παρα *near*, and ἡλιος *ſun*, in natural philoſophy, a mock ſun or meteor, in form of a very bright light, appearing on the one ſide of the ſun.

Appearances of this kind have been made mention of both by the ancients and moderns. Ariſtotle obſerves, that in general they are ſeen only when the ſun is near the horizon, though he takes notice of two that were ſeen in Boſphorus from morning to evening; and Pliny has related the times when ſuch phenomena were obſerved at Rome. Gaſſendi ſays, that in 1635 and 1636 he often ſaw one mock ſun. Two were obſerved by M. de la Hire in 1689; and the ſame number by Caſſini in 1693, Mr Grey in 1700, and Dr Halley in 1702: but the moſt celebrated appearances of this kind were ſeen at Rome by Scheiner, by Muſchenbroek at Utrecht, and by Hevelius at Sedan. By the two former, four mock ſuns were obſerved, and by the latter ſeven.

Parhelia are apparently of the ſame ſize with the ſun, though not always of the ſame brightneſs, nor even of the ſame ſhape; and when a number appear at once, there is ſome difference in both theſe reſpects among them. Externally they are tinged with colours like the rainbow; and many have a long fiery tail oppoſite to the ſun, but paler towards the extremity. Parhelia are generally accompanied with coronas, ſome of which are tinged with rainbow colours, but others are white. They differ in number and ſize; but all agree in breadth, which is that of the apparent diameter of the ſun.

A very large white circle, parallel to the horizon, generally paſſes through all the parhelia; and, if it were entire, it would go through the centre of the ſun. Sometimes there are arcs of leſſer circles concentric to this, touching thoſe coloured circles which ſurround the ſun. They are alſo tinged with colours, and contain other parhelia. There are alſo ſaid to have been other circles obliquely ſituated with reſpect to all thoſe we have mentioned; but of this we have met with no authentic account. The order of the colours in theſe circles is the ſame as in the rainbow; but on the inſide, with reſpect to the ſun, they are red, as is alſo obſerved in many other coronas.

Parhelia have been viſible for 1, 2, 3, and 4 hours together; and in North America they are ſaid to continue ſome days, and to be viſible from ſunriſe to ſunſet.

When the parhelia diſappear, it ſometimes rains, or there falls ſnow in the form of oblong ſpiculæ, as Maraldi, Weidler, Krafft, and others, have obſerved; and becauſe the air in North America abounds with ſuch frozen ſpiculæ, which are even viſible to the eye, according to Ellis and Middleton, ſuch particles have been thought to be the cauſe of all coronas and parhelia.

Mr Ellis ſays, that, at Churchill in Hudſon's Bay, the riſing of the ſun is always preceded by two long ſtreams of red light, one on each ſide of him, and about 20° diſtant from him. Theſe riſe as the ſun riſes; and as they grow longer begin to bend towards each other, till they meet directly over the ſun, juſt as he riſes, forming there a kind of parhelion or mock ſun. Theſe two ſtreams of light, he ſays, ſeem to have their ſource in two other parhelia, which riſe with the true ſun; and in the winter ſeaſon, when the ſun never riſes above the haze or fog, which he ſays is conſtantly found near the horizon, all theſe accompany him the whole day, and ſet with him in the ſame manner as they riſe. Once or twice he ſaw a fourth parhelion directly under the true ſun; but this, he ſays, is not common. Theſe facts being conſtant, are very valuable, and may throw great light on the theory of theſe remarkable phenomena.

Sometimes parhelia appear in a different manner; as when three ſuns have been ſeen in the ſame vertical circle, well defined, and touching one another. The true ſun was in the middle, and the loweſt touched the horizon; and they ſet one after the other. This appearance was ſeen by M. Maleziew in 1722. Other appearances ſimilar to this are recited by M. Muſchenbroeck.

Sometimes the ſun has riſen or ſet with a luminous tail projecting from him, of the ſame breadth with his diameter, and perpendicular to the horizon. Such an appearance was ſeen by Caſſini in 1672 and 1692, by De la Hire in 1702, and by Mr Ellis in Hudſon's Bay.

As M. Feuilée was walking on the banks of the river La Plata, he ſaw the ſun riſing over the river with a luminous tail projecting downwards, which continued till he was ſix degrees high.

Paraſelenæ, or mock moons, have alſo been ſeen, accompanied with tails and coloured circles, like thoſe which accompany the parhelia. An account of ſeveral, and a particular deſcription of a fine appearance of this kind, may be ſeen in Muſchenbroek.

The Roman phenomenon, obſerved by Scheiner, is famous on account of its having been the firſt appearance of the kind that engaged the attention of philoſophers. It is repreſented in fig. 1.; in which A is the place of the obſerver, B his zenith, C the true ſun, AB a plane paſſing through the obſerver's eye, the true ſun, and the zenith. About the ſun C, there appeared two concentric rings, not complete, but diverſified with colours. The leſſer of them, DEF, was fuller, and more perfect; and though it was open from D to F, yet thoſe ends were perpetually endeavouring to unite; and ſometimes they did ſo. The outer of theſe rings was much fainter, ſo as ſcarcely to be diſcernible. It had, however, a variety of colours; but was very inconſtant. The third circle, KLMN, was very large, and all over white, paſſing through the middle of the ſun, and everywhere parallel to the horizon. At firſt this circle was entire; but towards the end of the appearance it was weak and ragged, ſo as hardly to be perceived from M towards N.

Plate CCCLXXVII

In the interſection of this circle, and the outward iris GKI, there broke out two parhelia or mock ſuns, N and K, not quite perfect; K being rather weak, but N ſhone brighter and ſtronger. The brightneſs of the middle of them was ſomething like that of the ſun; but towards the edges they were tinged with colours like thoſe of the rainbow; and they were uneven and ragged. The parhelion N was a little wavering, and ſent out a ſpiked tail, NP, of a colour ſomewhat fiery, the length of which was continually changing.

The parhelia at L and M in the horizontal ring were not ſo bright as the former; but were rounder, and white, like the circle in which they were placed. The parhelion N diſappeared before K; and while M grew fainter, K grew brighter, and vaniſhed the laſt of all.

It is to be obſerved farther, that the order of the colours in the circles DEF, GKN, was the ſame as in the common halos, namely, red next the ſun; and the diameter of the inner circle was alſo about 45 degrees; which is the uſual ſize of a halo.

The reverend Dr Hamilton ſent the following account of parhelia ſeen at Cookſtown to the Royal Iriſh Academy.

"Wedneſday September 24. 1783, as I was preparing to obſerve the ſun paſſing the meridian, before the firſt limb touched the centre wire, it was obſcured by a dark well defined cloud, about 10° in diameter. Upon going to the door of the tranſit room, to ſee if it was likely ſoon to paſs off the diſk of the ſun, I obſerved the following phenomena: From the weſtern edge of the cloud iſſued a luminous arc parallel to the horizon, perfectly well defined, extending exactly to the northern meridian; it was about 30′ broad, white, and ended in a blunted termination. On it were two parhelia; the neareſt to the ſun diſplaying the priſmatic colours; the remote one white, and both ill defined. In a ſhort time the cloud had paſſed off, and ſhowed the luminous almucantar, reaching perfect to the true ſun. While things were thus ſituated, I meaſured with an accurate ſextant the diſtances of the parhelia; I found the coloured one 26°, the remoter one 90°, from the true ſun. Juſt as I had done this, a new and priſmatic circle ſurrounded the ſun immediately with the priſmatic parhelion. And now another coloured parhelion appeared on the eaſtern board.—The ſextant with its face up and down, exactly meaſured this and the former at the original diſtance of 26°; the luminous almucantar ſtill remaining perfect. In about 10 or 12 minutes whitiſh hazy clouds came on, and obſcured all theſe uncommon appearances.—I did not obſerve that the atmoſpherical phenomena before or after were at all uncommon. The wind a light breeze at SSW. Bar. 29,6 riſing. Thermometer 55°.

In fig. 2. SM repreſents the ſouth meridian; NM the north meridian; PP the priſmatic circle, with two priſmatic ſuns or parhelia, at 26° diſtance on each ſide the true ſun; W the white parhelion, at 90° diſtance from the true ſun; LA the luminous almucantar; and HO the horizon.

Various hypotheſes have been framed by philoſophers to account for this phenomenon, particularly by M. Marriotte, Deſcartes, and Huygens. None of them, however, are ſatisfactory: but thoſe readers who wiſh to become acquainted with them may conſult Huygens's Diſſertation on this ſubject, in Smith's Optics, Book I. ch. 11. Muſchenbroeck's Introduction, &c. Vol. XI. p. 1038, &c. 4to.; but eſpecially Dr Prieſtley's Hiſtory of Viſion, Light, and Colours, Vol. II. p. 613, &c.

PARIA, or New Andalusia, a country of Terra Firma in South America; bounded on the north by the north ſea; on the eaſt by Surinam; on the weſt by New Granada and the Caraccas: and on the ſouth by Guiana. It produces colouring drugs, gums, medicinal roots, Brazil wood, ſugar, tobacco, and ſome valuable timber; the inland parts being woody and mountainous, but interſperſed with fine valleys that yield corn and paſturage. Comana is the capital town.

PARIAN Chronicle. See *Arundelian Marbles*, and *Parian Chronicle*.

Under the article *Parian Chronicle*, we have been as full as the ſubject ſeemed to require, or as the nature of our work would admit. It is unneceſſary, therefore, to reſume it in this place. Such of our readers, however, as wiſh for further information on this ſubject (which is equally intereſting to the ſcholar and to the antiquarian) we muſt refer to Robertſon's attack upon their authenticity, and to Gough's learned and judicious vindication of the authenticity, publiſhed in *Archæologia* for 1789. The extent of his learning, and the ſolidity of his arguments, appear upon the whole to outweigh the objections of his ſenſible and plauſible opponent. Hewlett's book upon the ſame ſide of the queſtion may command ſome degree of attention. It is ingenious. See *Sandwich Marble*.

Parian Marble, in the natural hiſtory of the ancients, the white marble uſed then, and to this day, for carving ſtatues, &c. and called by us at this time *ſtatuary marble*.

Too many of the later writers have confounded all the white marbles under the name of the *Parian;* and among the workmen, this and all the other white marbles have the common name of *alabaſters;* ſo that it is in general forgotten among them, that there is ſuch a thing as alabaſter different from marble; which, however, is truly the caſe. Almoſt all the world alſo have confounded the Carrara marble with this, though they are really very different; the Carrara kind being of a finer ſtructure and clearer white than the Parian; but leſs bright and ſplendid, harder to cut, and not capable of ſo glittering a poliſh.

The true Parian marble has uſually ſomewhat of a faint bluiſh tinge among the white, and often has blue veins in different parts of it. It is ſuppoſed by ſome to have had its name from the iſland Paros †, one of the Cyclades in the Ægean ſea, where it was firſt found; but others will have it to have been ſo called from Agoracritus Parius, a famous ſtatuary, who ennobled it by cutting a ſtatue of Venus in it.

PARIAS, or Perreas, a tribe of Hindoos, ſo peculiarly diſtinguiſhed from all others, that they live by themſelves in the outſkirts of towns; and, in the country, build their houſes apart from the villages, or rather have villages of their own, furniſhed with wells; for they dare not ſo much as fetch water from thoſe which other families make uſe of; and, leſt theſe latter ſhould inadvertently go to one of theirs, they are obliged to ſcatter the bones of dead cattle about their wells, that they may be known. They dare not in cities paſs through the ſtreets where the Bramins live; nor ſet foot in the villages where they dwell.—They are likewiſe forbidden to enter a temple, either of their god Wiſtnow or Eſwara; becauſe they are held impure. They get their bread by ſowing, digging, and building the walls of mud houſes; moſt of thoſe inhabited by the common people being raiſed by theſe Parias; who alſo do ſuch kinds of dirty work as other people do not care to meddle with. Nor is their diet much more cleanly; for they do not ſcruple to eat cows, horſes, fowl, or other carrion, which die of themſelves, and even ſtink. One would ſcarce imagine, that contentions for precedency ſhould ever enter into the thoughts of a people who have renounced all cleanlineſs, and, like ſwine, wallow in filth; and yet pride has divided the Parias into two claſſes: the firſt are ſimply called *Parias*, the other *Seriperes*. The employment of theſe latter is to go about ſelling leather, which they dreſs; alſo to make bridles, and ſuch kind of things: ſome of them likewiſe ſerve for ſoldiers. The Parias, who reckon themſelves the better family, will not eat in the houſe of the Seriperes; but the Seriperes will readily eat with the Parias. For this reaſon they are obliged to pay them reſpect, by lifting their hands aloft, and ſtanding upright before them. Theſe Seriperes, when they marry, cannot ſet up a pandal, a kind of garland, before their doors, made with more than three ſtakes or trees; ſhould they exceed that number, the whole city would be in motion. The Seriperes are likewiſe ſubject to ſome ſort of ſlavery; for when any perſon of credit or authority dies in the families of the Komitis, Sittis, Palis, farriers, or goldſmiths, and the friends have a mind to be at the expence of ſome clothes to give the Seriperes, theſe latter muſt ſuffer their beards to be ſhaven; and when the corpſe is carried out of town to be burned or interred, they muſt do that office; for which each receives a *fanum*, or one piece and a half of ſilver, worth three ſous and a half. Theſe are the ſame ſort of people who are called at Surat *Halalchors;* that is, in the Perſian language, "eat-alls, or eaters at large." Nothing can offend an Hindoo more than to be called a Halalchor: yet theſe poor people are not offended, cringe and bow to all they paſs, and go through their drudgery without noiſe or concern.

Mod. Univ. Hiſt. v. 5.

The Parias are very vicious, ſtupid, and ignorant, occaſioned by their wretched way of life: The Bramins and nobility ſhun them as if they had the plague, and look on the meeting a Parias as the greateſt misfortune. To come near one of them is a ſin, to touch them a ſacrilege. If a Parias were dying, it is infamy to viſit him, or to give him the leaſt aſſiſtance, in the utmoſt danger or diſtreſs. A Bramin who unavoidably ſhould touch a Parias, immediately waſhes himſelf from the impurity. Even their ſhadow and breath being reckoned contagious, they are obliged to live on the eaſt ſide of their towns, that the weſterly winds which reign in this country may keep back their breath. And it is lawful for a Bramin to kill one of theſe unhappy creatures, if he does not avoid it by getting out of his way: In ſhort, they think them reprobated by God, and believe the ſouls of the damned enter into the Parias, to be puniſhed for their crimes.—Yet the miſſion have found among theſe dregs of the people very active zealous catechiſts, who by their labours have very much contributed to the converſion of their countrymen, particularly one Rajanaiken a Paria ſoldier, who, of all the inferior miſſionaries, has diſtinguiſhed himſelf moſt by his labours and ſufferings.

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† *See Paros.*

PARIETALIA OSSA, in anatomy. See there N° 13.

PARIETARIA, *Pellitory of the Wall*: A genus of the monœcia order, belonging to the polygamia claſs of plants; and in the natural method ranking under the 53d order, *Scabridæ*. The calyx of the hermaphrodite is quadrifid; there is no corolla; there are four ſtamina; one ſtyle; and one ſeed, ſuperior and elongated. The female calyx is quadrifid; there is no corolla; nor are there any ſtamina. There is one ſtyle; and one ſeed ſuperior, and elongated. There are ſix ſpecies, of which one named the *officinalis* is uſed in medicine. This has a creeping root. The ſtalk grows erect, is rough to the touch, and adheſive. The leaves are alternate, elliptical, lanceolate, veined, and a little rough. The flowers grow out of the alæ of the leaves, in ſeſſile, branched, verticillate cluſters, of a greeniſh colour tinged with red. The antheræ have a great degree of ſenſibility; for, if irritated with the point of a pin, they fly from the calyx with elaſtic force, and throw out their powder. The plant has a cooling and diuretic quality. Three ounces of the juice taken internally, or a fomentation externally applied, have been found ſerviceable in the ſtrangury. The plant laid upon heaps of corn infeſted with weevils, is ſaid to drive away thoſe deſtructive inſects.

PARIETES, in anatomy, a term uſed for the encloſures or membranes that ſtop up or cloſe the hollow parts of the body; eſpecially thoſe of the heart, the thorax, &c. The parietes of the two ventricles of the heart are of unequal ſtrength and thickneſs; the left exceeding the right, becauſe of its office, which is to force the blood through all parts of the body; whereas the right only drives it through the lungs.

PARIS (Matthew), one of our beſt hiſtorians from William the Conqueror to the latter end of the reign of Henry III. but of his life few particulars have been tranſmitted to us. Leland his original biographer, without determining whether he was born in France or England, informs us, that he was a monk of St Alban's, and that he was ſent by Pope Innocent to reform the monks of the convent at Holm in Norway. Biſhop Bale, the next in point of time, adds to the above relation, that, on account of his extraordinary gifts of body and mind, he was much eſteemed, particularly by King Henry III. who commanded him to write the hiſtory of his reign. Fuller makes him a native of Cambridgeſhire, becauſe there was an ancient family of his name in that county. He alſo mentions his being ſent by the pope to viſit the monks in the dioceſe of Norwich. Biſhop Tanner, Biſhop Nicholſon, Doctor Du Pin, and the *Nouveau Dictionnaire Hiſtorique*, add not a ſingle fact to thoſe above related. Matthew Paris died in the monaſtery of St. Alban's in the year 1259. He was doubtleſs a man of extraordinary knowledge for the 13th century; of an excellent moral character, and, as an hiſtorian, of ſtrict integrity. His ſtyle is unpoliſhed; but that defect is ſufficiently atoned for by the honeſt freedom with which he relates the truth, regardleſs of the dignity or ſanctity of the perſons concerned. His works are, 1. *Hiſtoria ab Adamo ad Conqueſtum Angliæ*, Lib. I. manuſcript, col. C. C. Cantab. c. ix. Moſt of this book is tranſcribed, by Matthew of Weſtminſter, into the firſt part of his *Florilegium*. 2. *Hiſtoria major, ſeu rerum Anglicanarum hiſtoria à Gul. Conqueſtoris adventu ad annum 43 Henrici* III. &c. ſeveral times printed. The firſt part of this hiſtory, viz. to the year 1235, is tranſcribed almoſt verbatim from the Chronicle of Roger Wendover; and the Appendix, from the year 1260, is the work of William Raſhinger, who was alſo a monk of St. Alban's. 3. *Vitæ duorum Offarum, Merciæ regum, S. Albani fundatorum*. 4. *Geſta 22 abbatum S. Albani*. 5. *Additamenta chronicorum ad hiſt. majorem*; printed. 6. *Hiſtoria minor, ſive epitome majoris hiſtoriæ*; manuſcript. Beſides many other things in manuſcript.

PARIS, ſon of Priam, king of Troy, by Hecuba, alſo named *Alexander*. He was decreed, even before his birth, to become the ruin of his country; and when his mother, in the firſt months of her pregnancy, had dreamed that ſhe ſhould bring forth a torch which would ſet fire to her palace, the ſoothſayers foretold the calamities which were to be expected from the imprudence of her future ſon, and which would end in the ruin of Troy. Priam, to prevent ſo great and ſo alarming an evil, ordered his ſlave Archelaus to deſtroy the child as ſoon as he was born. The ſlave, either touched with humanity, or influenced by Hecuba, did not obey, but was ſatisfied to expoſe the child on Mount Ida, where the ſhepherds of the place found him, and educated him as their own. Some attribute the preſervation of his life, before he was found by the ſhepherds, to the motherly tenderneſs of a ſhe bear who ſuckled him. Young Paris, though educated among ſhepherds and peaſants, gave very early proofs of courage and intrepidity; and from his care in protecting the flocks of Mount Ida from the rapacity of the wild beaſts, he was named *Alexander*, "helper or defender." He gained the eſteem of all the ſhepherds, and his graceful countenance and manly deportment recommended him to the favours of Œnone, a nymph of Ida, whom he married, and with whom he lived with the moſt perfect tenderneſs. Their conjugal peace was, however, of no long duration. At the marriage of Peleus and Thetis, the goddeſs of diſcord, who had not been invited to partake of the entertainment, ſhowed her diſpleaſure, by throwing into the aſſembly of the gods who were at the celebration of the nuptials, a golden apple, on which were written the words *Detur pulchriori*. All the goddeſſes claimed it as their own; the contention at firſt became general; but at laſt only three, Juno, Venus, and Minerva, wiſhed to diſpute their reſpective right to beauty. The gods, unwilling to become arbiters in an affair ſo tender and ſo delicate in its nature, appointed Paris to adjudge the prize of beauty to the faireſt of the goddeſſes; and indeed the ſhepherd ſeemed ſufficiently qualified to decide ſo great a conteſt, as his wiſdom was ſo well eſtabliſhed, and his prudence and ſagacity ſo well known. The goddeſſes appeared before their judge without any covering or ornament, and each endeavoured by promiſes and entreaties to gain the attention of Paris, and to influence his judgment. Juno promiſed him a kingdom; Minerva military glory; and Venus the faireſt woman in the world for his wife, as Ovid expreſſes it, *Heroid* 17. v. 118.

Unaque cum regnum; belli daret altera laudem;
Tyndaridis conjux, tertia dixit, eris.

After he had heard their ſeveral claims and promiſes, Paris adjudged the prize to Venus, and gave her the golden apple, to which perhaps ſhe ſeemed entitled as the goddeſs of beauty. This deciſion of Paris drew upon the judge and his family the reſentment of the two other goddeſſes. Soon after, Priam propoſed a conteſt among his ſons and other princes, and promiſed to reward the conqueror with one of the fineſt bulls of Mount Ida. His emiſſaries were ſent to procure the animal, and it was found in the poſſeſſion of Paris, who reluctantly yielded it. The ſhepherd was anxious to regain his favourite, and he went to Troy and entered the liſts of the combatants. He was received with the greateſt applauſe, and obtained the victory over his rivals, Neſtor the ſon of Neleus, Cycnus ſon of Neptune, Polites, Helenus, and Deiphobus, ſons of Priam. He likewiſe obtained a ſuperiority over Hector himſelf; which prince, enraged to ſee himſelf conquered by an unknown ſtranger, purſued him cloſely; and Paris muſt have fallen a victim to his brother's rage, had he not fled to the altar of Jupiter. This ſacred retreat preſerved his life; and Caſſandra the daughter of Priam, ſtruck with the ſimilarity of the features of Paris with thoſe of her brothers, inquired his birth and his age. From theſe circumſtances ſhe ſoon diſcovered that he was her brother, and as ſuch ſhe introduced him to her father and to her brothers. Priam acknowledged Paris as his ſon, forgetful of the alarming dreams which had cauſed him to meditate his death, and all jealouſy ceaſed among the brothers. Paris did not long ſuffer himſelf to remain inactive; he equipped a fleet, as if willing to redeem Heſione his father's ſiſter, whom Hercules had carried away and obliged to marry Telamon the ſon of Æacus. This was the pretended motive of his voyage, but the cauſes were far different. Paris remembered that he was to be the huſband of the faireſt of women; and, if he had been led to form thoſe expectations while he was an obſcure ſhepherd of Ida, he had now every plauſible reaſon to ſee them realized, ſince he was the acknowledged ſon of the king of Troy. Helen was the faireſt woman of the age, and Venus had promiſed her to him. On theſe grounds, therefore, he went to Sparta, the reſidence of Helen, who had married Menelaus. He was received with great reſpect; but he abuſed the hoſpitality of Menelaus, and while the huſband was abſent in Crete, Paris perſuaded Helen to elope with him, and to fly to Aſia. Helen conſented; and Priam received her into his palace without difficulty, as his ſiſter was then detained in a foreign country, and as he wiſhed to ſhow himſelf as hoſtile as poſſible to the Greeks. This affair was ſoon productive of ſerious conſequences. When Menelaus had married Helen, all her ſuitors had bound themſelves by a ſolemn oath to protect her perſon, and to defend her from every violence; and therefore the injured huſband reminded them of their engagements, and called upon them to recover her. Upon this all Greece took up arms in the cauſe of Menelaus; Agamemnon was choſen general of all the combined forces, and a regular war was begun. Paris, meanwhile, who had refuſed Helen to the petitions and embaſſies of the Greeks, armed himſelf, with his brothers and ſubjects, to oppoſe the enemy; but the ſucceſs of the war was neither hindered nor accelerated by his means. He fought with little courage, and at the very ſight of Menelaus, whom he had ſo recently injured, all his reſolution vaniſhed, and he retired from the front of the army, where he walked before like a conqueror. In a combat with Menelaus, which he undertook by means of his brother Hector, Paris muſt have periſhed, had not Venus interfered, and ſtolen him from the reſentment of his antagoniſt. He wounded, however, in another battle, Machaon, Euryphilus, and Diomedes; and, according to ſome opinions, he killed with one of his arrows the great Achilles.

The death of Paris is differently related: ſome ſay that he was mortally wounded by one of the arrows of Philoctetes, which had been once in the poſſeſſion of Hercules; and that when he found himſelf languid on account of his wounds, he ordered himſelf to be carried to the feet of Œnone, whom he had baſely abandoned, and who in the years of his obſcurity had foretold him that he would ſolicit her aſſiſtance in his dying moments. He expired before he came into the preſence of Œnone; and the nymph, ſtill mindful of their former loves, threw herſelf upon his body, and ſtabbed herſelf to the heart, after ſhe had plentifully bathed it with her tears. According to others, Paris did not immediately go to Troy when he left the Peloponneſus, but he was driven on the coaſts of Egypt, where Proteus, who was king of the country, detained him; and when he heard of the violence which had been offered to the king of Sparta, he kept Helen at his court, and permitted Paris to retire. Whatever was the mode of his death, it took place, we are told about 1188 B. C. See Troy, &c.

Paris, the capital of the kingdom of France; is ſituated on the river Seine, in the Iſle of France, being one of the largeſt and fineſt cities in Europe. It derived its modern name from the ancient Pariſii; and is ſuppoſed by ſome to have had the Latin name of *Lutetia*, from *Lutum*, "mud," the place where it now ſtands having been anciently very marſhy and muddy. Ever ſince the reign of Hugh Capet, that is, for near 800 years, this city hath been the uſual reſidence of the kings of France; it is of a circular form, and, including the ſuburbs, about five French leagues, or 15 Engliſh miles, in circumference. The number of its inhabitants is computed at about 500,000 (A); that of its

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(A) The lateſt, and perhaps the moſt accurate, accounts, have ſtated the number of inhabitants in Paris at conſiderably upwards of 800,000. It is ſuppoſed to be leſs than London, but the difference is not thought to be very great.

ſtreets 912; and that of its houſes upwards of 20,000, excluſive of the public ſtructures of all ſorts. Its greateſt defect, according to ſome, is the want of good drinking water; but others tell us, that very fine water is brought by an aqueduct from the village of Arcueil, not far from Paris, but own that the water of the Seine, and the city, is not good. The ſtreets are of a proper breadth, well built, paved, and lighted. There is a great number of tribunals and offices here; moſt of which are kept in the Palais, ſituated on an iſland, to which it gives name. The number of churches, convents, hoſpitals, market places, fountains, gates, and bridges, in this city is very great; beſides the univerſity, ſeveral academies, public libraries, royal palaces and caſtles, and above 100 hotels, ſome of them very ſtately. But to be more particular, that part called *la Cité*, lies in the centre, and conſiſts of three iſlands formed by the Seine, *viz.* L'Iſle de Palais, L'Iſle de Notre Dame, and L'Iſle Louviers. It is the principal of the three parts into which the city is divided, and contains the following remarkable ſtructures: 1. Several bridges; of which ſome are of wood and others of ſtone, and have moſt of them a row of houſes on each ſide. The chief of theſe are the Pont-neuf and Pont-royal: the firſt conſiſts of 12 arches, which, properly ſpeaking, make two bridges, the one leading from the ſuburb of St Germain to the city, and the other from thence to that part called *la Ville*: there is a carriage way in the middle 30 feet broad, and foot-walks on each ſide, raiſed two feet high; and in the centre ſtands a braſs ſtatue of King Henry IV. on horſeback. On this bridge is alſo the building called *La Samaritaine*, from a group of figures upon it repreſenting our Saviour and the Samaritan woman, ſtanding near Jacob's well. Here is a pump to raiſe the water, which through ſeveral pipes ſupplies the quarter of the Louvre, and ſome other parts of the town. The Pont-royal, which leads to the Thuilleries, was built by order of Lewis XIV. in the room of a wooden bridge that was carried away by the current in 1684. 2. The cathedral of Notre Dame, or our Lady, being dedicated to the Holy Virgin, which is a large ſtately Gothic ſtructure, ſaid to have been founded by King Childeric, and built in the form of a croſs. Here, beſides other great perſonages, are interred the cardinals de Retz and Noailles. From the two ſquare towers belonging to it, is a noble proſpect of the city and neighbouring country. Here is a vaſt quantity of gold and ſilver plate, rich tapeſtry, and fine paintings; and the number of the canons is no leſs than 50. Near it ſtands the palace of the archbiſhop, in which is the advocates library: the revenue of the archbiſhop amounts to about 180,000 livres; and his taxation to the court of Rome is 4283 guilders. 3. The priory and pariſh church of St Bartholomew; the laſt of which is the moſt beautiful in all this part of the city, and ſtands near the Palais. 4. The Palais, which gives name to an iſland, and in which the parliament, with a great many other courts, are held. It was anciently the reſidence of the kings; but was given to the officers of juſtice by Philip the Fair, who alſo ſettled the parliament here in 1302. The parliament, conſiſting of ſeveral chambers, each of which has its department, is opened the day after Martinmas with a ſolemn maſs, celebrated by a biſhop, and continues ſitting till the 8th of September, when a vacation chamber is appointed during the interval, for criminal cauſes, and others which require deſpatch. The juriſdiction of this court is of great extent. There is a beautiful chapel belonging to the Palais: in which is alſo the priſon, or jail, for the juriſdiction of the parliament, called in French *La Conciergerie*. 5. The Hotel Dieu, the moſt ancient and largeſt hoſpital in Paris, in which 8000 ſick and infirm poor are taken care of, and attended by the nuns of the order of St Auguſtine. 6. The hoſpital of St Catharine, where poor women and maidens are entertained three days, and attended by the above-mentioned nuns. 6. The Grande Chatelet, where ſome of the inferior courts of juſtice hold their ſeſſions. 8. Fort l'Eveque, in which is the mint and a priſon. It ſtands in or near the ſtreet La Ferroniere, in which Henry IV. was ſtabbed by Ravilliac. 9. St Germain l'Auxerrois, which is called the *royal palace church*; becauſe the palaces of the Louvre and Thuilleries ſtand in its pariſh. 10. The Louvre, an ancient royal palace, of which a part was rebuilt by Lewis XIV. Had it been completed on the ſame plan, it would have been a moſt magnificent ſtructure. On one of its gates is the following inſcription, *Dum totum impleat orbem*: the meaning of which is, "May it laſt till the owner of it hath extended his ſway over the whole world:" which implies what the French kings have conſtantly aimed at. Another inſcription ſhows, at the ſame time, the vanity of the nation, and their abject flattery of their grand monarque. It may be rendered in Engliſh thus:

> Louvre is a palace for great Lewis fit:
> God him alone exceeds, as heaven does it.

This palace is joined to the Thuilleries by a gallery, in which are 180 models of fortreſſes, ſome ſituated in France, and ſome in other countries, executed with the utmoſt accuracy. Here is a valuable collection of paintings, the king's printing houſe, the mint where the king's medals are ſtruck, together with a prodigious quantity of rich tapeſtry hangings, and a collection of ancient arms, among which are thoſe worn by Francis I. at the famous battle of Pavia. Here alſo the French academy, the academy of inſcriptions and belles letters, the royal academy of ſciences, the academy of painting and ſculpture, and the royal acacemy of architecture, have their meetings. The firſt of theſe was founded for the improvement of the French language; and as for the others, their names explain the deſign of their inſtitution. 11. Le Palais Royal, which was built by Cardinal Richelieu, in the year 1636, and belongs to the duke of Orleans. It is ſaid to contain pictures to the value of four millions of livres, which were purchaſed by the regent of that title, and of which a part belonged to Chriſtina queen of Sweden. 12. The palace des Thuilleries, ſo called from a tile or brick kiln which ſtood there formerly. This palace, as we obſerved above, communicates with the Louvre by a gallery. Behind it are exceeding pleaſant gardens, adorned with fine walks, planted with evergreens, and other trees, and with beautiful parterres, where are to be ſeen, all the year round, every flower according to its ſeaſon. There are alſo three fine fountains in the garden, and a canal. Behind the Thuilleries, on the bank of the river, are pleaſant walks, compoſed of four rows of lofty elms, to which vaſt crowds of people reſort in the fine weather, as well as to the gardens. In the palace is a ſpacious and magnificent theatre; and hard by it are the Elyſian fields, where a ſurpriſing number of coaches are to be ſeen in fair weather: not far off is the church of St Roche, where the celebrated poet Corneille is interred. 13. La place de Louis le Grand, a very beautiful ſquare, in the centre of which is an equeſtrian ſtatue of that king, which is juſtly accounted a maſterpiece. 14. The Place, or Square des Victoires, which is round, and contains a ſtatue of Lewis XIV. of gilt braſs, erected to him by the duke de la Fuillade, with this inſcription, *Viro immortali.* 15. The Royal Library in the Rue Vivien, which contains 94,000 printed books, 30,000 manuſcripts, and a prodigious collection of copperplates and medals. Near by, in the churchyard of St Joſeph, lies the famous comic poet Moliere. 16. The pariſh church of St Euſtace, which ſtands in the quarter of the ſame name, and contains the tomb of the great miniſter Colbert. 17. The gate of St Dennis, which was erected as a triumphal arch in honour of Lewis XIV. 18. The gate of St Martin, erected alſo in form of a triumphal arch, in honour of the ſame king. Not far from hence, in the churchyard of St Nicholas des Champs, Peter Gaſſendi, and other learned men, are buried. 19. La Greve, an open place, where all public rejoicings are celebrated, and malefactors executed. 20. The Hotel de Ville, which is a large building of Gothic architecture, though adorned with columns of the Corinthian order. 21. The arſenal in the quarter of St Paul, conſiſting of many ſpacious buildings, among which are a foundery, and a houſe for making ſaltpetre. Here is a muſquetoon of two barrels, which it is ſaid will pierce a thick board at the diſtance of ſix miles; and for diſcerning an object at that diſtance, has a teleſcope fixed to the barrel. 22. The Baſtile, a kind of fortreſs like the Tower of London, which is uſed as a priſon for ſtate criminals, and for ſuch as are taken up by letters de cachet, *i. e.* by warrants ſigned by the king, and ſealed. 23. Le Temple, a commandery of the knights of Malta, which gives name to a quarter, wherein, being a privileged place, artificers that are not freemen may carry on their buſineſs without moleſtation. The temple is the reſidence of the grand prior of the French nation. 24. That formerly called *La Maiſon profeſſe des Jeſuites*, in the quarter of St Anthony, in the church of which the hearts of Lewis XIII. and XIV. are preſerved, each in a caſket of gold, ſupported by two angels of maſſy ſilver, and as big as the life, hovering with expanded wings. In the ſame quarter is a fine looking glaſs manufacture, where above 500 perſons are employed in poliſhing plates caſt at St Gobin; with a convent of Franciſcans, the monks of which are called *Pique puces*, or *Prick fleas*.

In that part of the city called the *Univerſity*, the principal places are,

1. The univerſity, which gives name to it and which was firſt founded, as it is ſaid, by Charles the Great: all the arts and ſciences are taught here, particularly law, phyſic, and divinity. There are above 40 colleges; of which the chief are thoſe of Sorbonne, of Navarre, of the faculty of phyſic, and of the four nations; but lectures are read only in eleven of them. The head of the univerſity is the rector, who is choſen every three months, but ſometimes is continued ſeveral years. All the profeſſors have ſettled ſalaries; the whole annual income of the univerſity amounting, it is ſaid, to about 50,000 livres. 2. The Gobelins, a houſe or palace, where a great number of ingenious artiſts, in various manufactures and handicrafts, are employed by the government. The moſt curious tapeſtry of all ſorts is made here. 3. The General Hoſpital, a moſt noble foundation for the poor of the female ſex, near 7000 objects being taken care of and provided for. The ſick are carefully tended; and thoſe that are in health are obliged to work; different wards being alloted for foundlings, for girls who ſew or knit, proſtitutes, idiots, and poor women: of the laſt, ſome are kept gratis, and others pay a ſmall matter. In the caſtle of Bicêtre, belonging to this hoſpital, and conſiſting of many large buildings, are near 4000 perſons of the other ſex, among which are perſons diſordered in their ſenſes, and ſuch as are afflicted with the venereal diſeaſe. To this hoſpital are alſo ſent children who abuſe their parents, and lead diſſolute lives. The fund for the maintenance of it, and the hoſpital de la Pitié, where poor children are brought up, together with the Hotel Dieu, amounts to above two millions of livres *per annum*. 4. The King's Phyſic Garden, in which are an infinite variety of plants and trees, a certain ſum being allotted by the king for keeping the garden in order, and improving it, and for lectures on botany, anatomy, chemiſtry, and the materia medica. A curious collection of natural curioſities is kept here. 5. The abbey of St Victor, in which is a public library, containing ſome very ancient and ſcarce books, ſeveral curious manuſcripts, and a prodigious collection of maps and copperplates. 6. The College of Phyſicians, to which belong five profeſſors. 7. The Little Chatelet, an old fortreſs, now uſed for a priſon. 8. The Rue St Jacques, chiefly inhabited by bookſellers. 9. The Royal College, and that of Lewis the Great: to the former belong twelve profeſſors. 10. The Abbey of St Genevieve, in which is the marble monument of King Clovis, the ſhrine of St Genevieve, a large library, with a cabinet of antiquities and natural curioſities. 11. The Royal Obſervatory, a moſt ſtately edifice, built on the higheſt part of the city. Several aſtronomers are maintained here by the king. 12. The Royal Academy of Surgery, inſtituted in 1721. 13. The Convent of Franciſcans, in the quarter of St Andrew, the richeſt in France. In the ſame quarter are ſome remains of the palace of Julian the Apoſtate, in which Childebert, and ſome other kings of the Franks, afterwards reſided. 14. The Playhouſe. 15. The Convent of Carthuſians, in the quarter of Luxemburgh, containing fine paintings. 16. The palace of Luxemburgh, or Orleans, a magnificent ſtructure, containing alſo ſome fine paintings by Rubens, and embelliſhed with a noble garden. In the Hotel des Ambaſſadeurs, ambaſſadors extraordinary are entertained for three days, and thoſe of remote countries all the time they ſtay at Paris. 17. The Abbey of St Germain des Prez, which contains a very valuable library, the manuſcripts alone making 8000 volumes: here alſo is a cabinet of antiquities. 18. The Hotel Royal des Invalides, erected by Louis XIV. in which

lame and ſuperannuated officers and ſoldiers are maintained. The buildings take up no leſs than 17 acres. The number of common ſoldiers here amount to about 3000, and of officers to about 500. The chapel is very magnificent. Hard by is a military academy, in which 500 young gentlemen are inſtructed in the art of war.

Our readers from the above account will be able to conceive what Paris was; what it is we cannot ſo eaſily ſhow them. Poſſeſſed by a ſet of men who diſgrace human nature, and whoſe reign may be as ſhort as that of a conſiderable number of thoſe who have preceded them, its ſtate in every ſenſe is fluctuating and undetermined; inſomuch that what may be true of it to-day, would perhaps be falſe to-morrow. Reſpecting its public buildings, internal police, and other circumſtances, it is impoſſible to ſpeak with certainty. The Baſtile is levelled with the duſt; but unjuſt impriſonments have not ceaſed; and other places in that extenſive capital overflow with unfortunate perſons who deſerved a better fate; whoſe only crime is, that they are related to the late lamented king; that they were once nobles or allied to nobility; or that they are churchmen, or wiſh for ſome regular government to relieve their diſtracted country from the anarchy that has deſtroyed it. The church of Notre Dame one of the fineſt cathedrals in Europe, is no more a place of Chriſtian worſhip, but has been ſolemnly dedicated by the deluded people to *reaſon* and *philoſophy*. Its archbiſhop has renounced the peaceful religion of Jeſus (a thing almoſt unheard of in the hiſtory of Chriſtianity); and has with his own hand knocked down thoſe images which ancient ſuperſtition indeed had erected, but which ſhould nevertheleſs have been removed with reverence and decency. On the whole, ſuch ſtrange and unlooked-for revolutions have taken place in this once flouriſhing city, as renders it impoſſible to ſay where they may end, or what may be their conſequences.—To give a hiſtory of the events that have occurred here within theſe few years, is not our buſineſs in an article of this ſort. They have been partly, *i. e.* as far as they were then known, mentioned under the article FRANCE; and for further information, our readers were there referred to REVOLUTION. To this article we again refer them, in hopes that ſomething deciſive may (by the time that we arrive at that period of our work) have taken place with reſpect to the kingdom of which Paris is the capital.

PARIS, *Herb Paris*, or *Truelove*: A genus of the trigynia order, belonging to the octandria claſs of plants; and in the natural method ranking under the 11th order, *Sarmentaceæ*. The calyx is tetraphyllous; there are four petals, narrow in proportion; the berry quadrilocular. There is but one ſpecies, growing naturally in woods and ſhady places both in Scotland and England. It hath a ſingle naked ſtem, greeniſh bloſſoms, and bluiſh black berries.—The leaves and berries are ſaid to partake of the properties of opium; and the juice of the berries is uſeful in inflammations of the eyes. Linnæus ſays, that the root will vomit as well as ipecacuanha, but muſt be taken in double the quantity. Goats and ſheep eat the plant; cows, horſes, and ſwine, refuſe it. Though this plant has been reckoned of a poiſonous nature, being ranked among the aconites; yet late authors attribute quite other properties to it, eſteeming it to be a counter poiſon, and good in malignant and peſtilential fevers.

Herb PARIS of Canada or of America, *Trillium*, in botany, a genus of the hexandria trigynia claſs: The characters are, that it has a three-leaved ſpreading empalement, and three oval petals; it has ſix awl-ſhaped ſtamina, terminated by oblong ſummits, and a roundiſh germen with three ſlender recurved ſtyles, crowned by ſingle ſtigmas; the germen afterwards becomes a roundiſh berry, with three cells filled with roundiſh ſeeds. There are three ſpecies.

Plaſter of PARIS. See *PLASTER of Paris.*

PARISH, the precinct of a parochial church, or a circuit of ground inhabited by people who belong to one church, and are under the particular charge of its miniſter.

The word comes from the Latin *parochia*, the Greek παροικια *habitation*; compounded of παρα *near*, and οικος *houſe*.—Accordingly Du Cange obſerves, that the name παροικια was anciently given to the whole territory of a biſhop, and derives it from *neighbourhood*; becauſe the primitive Chriſtians, not daring to aſſemble openly in cities, were forced to meet ſecretly in neighbouring houſes.

In the ancient church there was one large edifice in each city for the people to meet in; and this they called *parochia*, "Pariſh." But the ſignification of the word was afterwards enlarged, and by a pariſh was meant a dioceſe, or the extent of the juriſdiction of a biſhop, conſiſting of ſeveral churches, unleſs we will ſuppoſe, as ſome do, that thoſe biſhops were only paſtors of ſingle churches. Du Pin obſerves, that country pariſhes had not their origin before the 4th century; but thoſe of cities are more ancient. The city of Alexandria is ſaid to have been the firſt that was divided into pariſhes.

How ancient the diviſion of pariſhes is, is not indeed abſolutely certain; for in the early ages of Chriſtianity in this iſland, pariſhes were unknown, or at leaſt ſignified the ſame that a dioceſe now does. There was then no appropriation of eccleſiaſtical dues to any particular church; but every man was at liberty to contribute his tithes to any prieſt or church he pleaſed, but he was obliged to do it to ſome; or if he made no ſpecial appropriation thereof, they were paid to the biſhop, whoſe duty it was to diſtribute them among the clergy, and for other pious purpoſes, according to his own diſcretion. Camden ſays England was divided into pariſhes by Archbiſhop Honorius about the year 630. Sir Henry Hobart maintains that pariſhes were firſt erected by the council of Lateran, held A. D. 1179. But Mr Selden proves, that the clergy lived in common without any diviſion of pariſhes, long after the time mentioned by Camden; and it appears from the Saxon laws, that pariſhes were in being long before the council of Lateran in 1179. The diſtinction of pariſhes occurs in the laws of King Edgar, about the year 970. It ſeems pretty clear and certain, ſays Judge Blackſtone (Com. Vol. I. p. 112.), that the boundaries of pariſhes were firſt aſcertained by thoſe of a manor or manors; becauſe it very ſeldom happens that a manor extends itſelf over more than one pariſh, though there are often many manors in one pariſh. The lords, he adds, as Chriſtianity ſpread, began to build churches upon their own demeſnes or waſtes, in order to accommodate

commodate their tenants in one or two adjoining lordſhips; and that they might have divine ſervice regularly performed therein, obliged all their tenants to appropriate their tithes to the maintenance of the one officiating miniſter, inſtead of leaving them at liberty to diſtribute them among the clergy of the dioceſe in general; and this tract of land, the tithes of which were ſo appropriated, formed a diſtinct pariſh; and this accounts for the frequent intermixture of pariſhes one with another. For if a lord had a parcel of land detached from the main of his eſtate, but not ſufficient to form a pariſh of itſelf, it was natural for him to endow his newly erected church with the tithes of ſuch lands. Extra-parochial waſtes and marſh lands, when improved and drained, are by 17 Geo. II. cap. 37. to be aſſeſſed to all parochial rates in the pariſh next adjoining. Camden reckons 9284 pariſhes in England; and Chamberlayne makes 9913. They are now generally reckoned about 10,000.

Pariſh Clerk. In every pariſh the parſon, vicar, &c. hath a pariſh clerk under him, who is the loweſt officer of the church. Theſe were formerly clerks in orders, and their buſineſs at firſt was to officiate at the altar; for which they had a competent maintenance by offerings; but they are now laymen, and have certain fees with the parſon on chriſtenings, marriages, burials, &c. beſides wages for their maintenance. The law looks upon them as officers for life: and they are choſen by the miniſter of the pariſh, unleſs there is a cuſtom for the pariſhioners or churchwardens to chooſe them; in which caſe the canon cannot abrogate ſuch cuſtom; and when choſen it is to be ſignified, and they are to be ſworn into their office by the archdeacon, for which the court of king's bench will grant a mandamus.

PARISII (anc. geog.), a people of Gallia Celtica, inhabiting the country about the Sequana and Matrona. Now a great part of the Iſle of France.—*Pariſii* (Ptolemy), a people of Britain, having the Brigantes to the north and weſt, the German ſea to the eaſt, and the Coritani to the ſouth, from whom they were ſeparated by the Humber. Now *Holderneſſe*, a peninſula of the Eaſt Riding of Yorkſhire.

PARISIORUM CIVITAS. See LUTETIA.

PARIUM (anc. geog.), a noble city of Myſia Minor, with a port on the Propontis; called *Adraſtia* by Homer, according to Pliny; but Strabo diſtinguiſhes them: according to others, the *Paeſtos* of Homer. *Pariani*, the people (Strabo). The birthplace of Neoptolemus ſurnamed *Gloſſographus* (Strabo). Here ſtood a Cupid equal in exquiſite workmanſhip to the Cnidian Venus.

PARK (French *parque*, i. e. *locus incluſus*), is a large quantity of ground encloſed and privileged for wild beaſts of chaſe, by the king's grant or preſcription. See CHASE and FOREST.

Manwood defines a chaſe to be "a privileged place, for beaſts of venery, and other wild beaſts of the foreſt and chaſe, *tam ſylveſtres, quam campeſtres*;" and differs from a chaſe or warren, in that it muſt be encloſed: for if it lies open, it is good cauſe of ſeizure into the king's hands, as a thing forfeited; as a free chaſe is, if it be encloſed: beſides, the owner cannot have an action againſt ſuch as hunt in his park, if it lies open. No man can erect a park without licenſe under the broad ſeal; for the common law does not encourage matter of pleaſure, which brings no profit to the commonwealth. But there may be a park in reputation erected without any lawful warrant; and the owner may bring his action againſt perſons killing his deer.

To a park three things are required. 1. A grant thereof. 2. Encloſures by pale, wall, or hedge, 3. Beaſts of a park; ſuch as the buck, doe, &c. And where all the deer are deſtroyed, it ſhall no more be accounted a park; for a park conſiſts of vert, veniſon, and encloſure: and if it is determined in any of them, it is a total diſparking.

Parks as well as chaſes are ſubject to the common law, and are not to be governed by the foreſt laws.

PARK, as connected with gardening. See GARDENING.

A park and a garden are more nearly allied than a farm and a garden †, and can therefore be accommodated to each other without any diſparagement to either. A farm loſes ſome of its characteriſtic properties by the connexion, and the advantage is on the part of the garden: but a park thus bordered retains all its own excellencies; they are only enriched, not counteracted, by the intermixture. The moſt perfect compoſition of a place that can be imagined, conſiſts of a garden opening into a park, with a ſhort walk through the latter to a farm, and ways along its glades to ridings in the country; but to the farm and the ridings the park is no more than a paſſage; and its woods and its buildings are but circumſtances in their views; its ſcenes can be communicated only to the garden.

† See *Farm* and *Gardening*.

The affinity of the two ſubjects is ſo cloſe, that it would be difficult to draw the exact line of ſeparation between them. Gardens have lately encroached very much both in extent and in ſtyle on the character of a park; but ſtill there are ſcenes in the one which are out of the reach of the other. The ſmall ſequeſtrated ſpots which are agreeable in a garden would be trivial in a park; and the ſpacious lawns which are among the nobleſt features of the latter, would in the former fatigue by their want of variety; even ſuch as, being of a moderate extent, may be admitted into either, will ſeem bare and naked, if not broken in the one; and loſe much of their greatneſs, if broken in the other. The proportion of a part to the whole is a meaſure of its dimenſions: it often determines the proper ſize for an object, as well as the ſpace fit to be allotted to a ſcene; and regulates the ſtyle which ought to be aſſigned to either.

But whatever diſtinctions the extent may occaſion between a park and a garden, a ſtate of highly cultivated nature is conſiſtent with each of their characters; and may in both be of the ſame kind, though in different degrees.

The excellencies both of a park and of a garden are happily blended at Hagley (A), where the ſcenes are equally

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(A) Near Stourbridge, in Worceſterſhire, the ſeat of Lord Lyttelton.

equally elegant and noble. It is ſituated in the midſt of a fertile and lovely country, between the Clent and the Witchberry hills; neither of which are within the pale, but both belong to the place. The latter riſe in three beautiful ſwells. One of them is covered with wood; another is an open ſheep walk, with an obeliſk on the ſummit; on the third, the portico of the temple of Theſeus, exactly on the model of that at Athens, and little leſs in the dimenſions, ſtands boldly out upon the brow, backed by the dark ground of a fir plantation, and has a moſt majeſtic appearance above the ſteeps which fall before and beſide it. The houſe is ſeen to the greateſt advantage from theſe eminences, and every point of them commands ſome beautiful proſpect. The buſy town of Stourbridge is juſt below them; the ruins of Dudley caſtle riſe in the offſkip; the country is full of induſtry and inhabitants; and a ſmall portion of the moor, where the minerals, manufactured in the neighbourhood, are dug, breaking in upon the horizon, accounts for the richneſs, without derogating from the beauty, of the landſcape. From the Clent hills the views are ſtill greater: they extend on one ſide to the black mountains in Wales, a long ridge which appears, at 60 miles diſtance, in the interval between the unwieldy heap of the Malvern hills and the ſolitary peak of the Wrekin, each 30 miles off, and as many aſunder. The ſmoke of Worceſter, the churches in Birmingham, and the houſes in Stourbridge, are diſtinctly viſible. The country is a mixture of hill and dale, and ſtrongly encloſed; except in one part, where a heath, varied by riſing grounds, pieces of water, and ſeveral objects, forms an agreeable contraſt to the cultivation which ſurrounds it. From the other extremity of the Clent hills, the proſpect is leſs extenſive; but the ground is more rude and broken; it is often overſpread with large and beautiful woods; and the view is dignified with numerous ſeats. The hills alſo being very irregular, large advanced promontories frequently interrupt the ſight, and vary the ſcene: in other parts, deep valleys ſhelving down towards the country below, exhibit the objects there in different lights. In one of theſe hollows is built a neat cottage, under a deep deſcent, ſheltered beſides by plantations, and preſenting ideas of retirement in the midſt of ſo much open expoſure; from the heights above it, is ſeen all that view which before was commanded from the Witchberry hills, but which is ſeen here over Hagley park; a noble fore ground, beautiful in itſelf, and completing the landſcape.

The houſe, though low in the park, is yet above the adjacent country, which it overlooks to a very diſtant horizon. It is ſurrounded by a lawn of fine uneven ground, and diverſified with large clumps, little groups, and ſingle trees. It is open in front, but covered on one ſide by the Witchberry hills; on the other ſide, and behind, by the eminences in the park, which are high and ſteep, and all overſpread with a lofty hanging wood. The lawn preſſing to the foot, or creeping up the ſlopes of theſe hills, and ſometimes winding along glades into the depth of the wood, traces a beautiful outline to a ſylvan ſcene, already rich to luxuriance in maſſineſs of foliage and ſtatelineſs of growth.

But though the wood appears to be entire, it in reality opens frequently into lawns, which occupy much of the ſpace within it. In the number, the variety, and the beauty of theſe lawns, in the ſhades of the ſeparation between them, in their beauties alſo, and their varieties, the glory of Hagley conſiſts. No two of the openings are alike in dimenſions, in ſhape, or in character. One is of no more than five or ſix acres; another of not leſs than fifty; and others are of all the intermediate ſizes. Some ſtretch out into lengthened glades; ſome widen every way: they are again diſtinguiſhed by buildings, by proſpects, and often by the ſtyle only of the plantations around them. The boundary of one is deſcribed by a few careleſs lines; that of another is compoſed of many parts, very different, and very irregular: and the ground is never flat; but falls ſometimes in ſteep deſcents, ſometimes in gentle declivities, waves along eaſy ſwells, or is thrown into broken inequalities, with endleſs variety.

An octagon ſeat, ſacred to the memory of Thomſon, and erected on his favourite ſpot, ſtands on the brow of a ſteep; a mead winds along the valley beneath, till it is loſt on either hand behind ſome trees. Oppoſite to the ſeat, a noble wood crowns the top, and feathers down to the bottom of a large oval ſwelling hill. As it deſcends on one ſide, the diſtant country becomes the offskip. Over the fall, on the other ſide, the Clent hill appears. A duſky antique tower ſtands juſt below them, at the extremity of the wood; and in the midſt of it is ſeen a Doric portico, called *Pope's Building*, with part of the lawn before it. The ſcene is very ſimple: the principal features are great; they prevail over all the reſt, and are intimately connected with each other.

The next opening is ſmall, circling about a rotunda on a knoll, to the foot of which the ground riſes every way. The trees which ſurround it are large; but their foliage is not very thick; and their ſtems appearing beneath, their ramifications between the boughs are, in ſo confined a ſpot, very diſtinguiſhed and agreeable circumſtances. It is retired; has no proſpect; no viſible outlet but one, and that is ſhort and narrow, to a bridge with a portico upon it, which terminates a piece of water.

The grove behind the rotunda ſeparates this from a large, airy, foreſt glade, thinly ſkirted with wood, careleſs of dreſs, and much overgrown with fern. The wildneſs is an acceptable relief in the midſt of ſo much elegance and improvement as reign in the neighbouring lawns: and the place is in itſelf pleaſant; in no part confined; and from a Gothic ſeat at the end is a perſpective view of that wood and tower which were ſeen before in front, together with the Witchberry hills, and a wide range of country.

The tower, which in proſpect is always connected with wood, ſtands however, on a piece of down, which ſtretches along the broad ridge of a hill, and ſpreads on each hand for ſome way down the ſides. Thick groves catch the falls. The deſcent on the right is ſoon loſt under the trees; but that on the left being ſteeper and ſhorter, it may be followed to the bottom. A wood hangs on the declivity, which is continued in the valley beneath. The tower overlooks the whole: it ſeems and remains of a caſtle, partly entire, partly in ruins, the partly overgrown with buſhes. A finer ſituation cannot be imagined: It is placed in an expoſed unfrequented ſpot; commands an extenſive proſpect; and is everywhere an intereſting object.

At the end of the valley below it in an obſcure corner, and ſhut out from all view, is a hermitage, compoſed of roots and of moſs: high banks, and a thick covert darkened with horſe cheſnuts, confine the ſequeſtered ſpot: a little rill trickles through it, and two ſmall pieces of water occupy the bottom. They are ſeen on one ſide through groups of trees; the other is open, but covered with fern. This valley is the extremity of the park; and the Clent hills riſe in all their irregularity immediately above it.

The other deſcent from the caſtle is a long declivity, covered like the reſt with noble woods, in which fine lawns are again emboſomed, differing ſtill from the former, and from each other. In one, the ground is very rough, the boundary is much broken, and marked only by the trunks of the trees which ſhoot up high before the branches begin. The next is more ſimple; and the ground falls from an even brow into one large hollow, which ſtops towards the glen, where it ſinks into the covert. This has a communication through a ſhort glade, and between two groves, with another called the *Tinian lawn*, from the reſemblance which it is ſaid to bear to thoſe of that celebrated iſland: it is encompaſſed with the ſtatelieſt trees, all freſh and vigorous, and ſo full of leaf, that not a ſtem, not a branch, appears, but large maſſes of foliage only deſcribe an undulating ouline; the effect, however, is not produced by the boughs feathering down to the bottom; they in appearance ſhoot out horizontally, a few feet above the ground, to a ſurpriſing diſtance, and from underneath an edging of ſhade, into which the retreat is immediate at every hour of the day. The verdure of the turf is as luxuriant there as in the open ſpace: the ground gently waves in both over eaſy ſwells and little dips, juſt varying, not breaking, the ſurface. No ſtrong lines are drawn; no ſtriking objects are admitted; but all is of an even temper, all mild, placid, and ſerene; in the gayeſt ſeaſon of the day not more than cheerful, in the ſtilleſt watch of night not gloomy. The ſcene is indeed peculiarly adapted to the tranquillity of the latter, when the moon ſeems to repoſe her light on the thick foliage of the grove, and ſteadily marks the ſhade of every bough. It is delightful then to ſaunter here, and ſee the graſs, and the goſſamer which entwines it, gliſtening with dew; to liſten and hear nothing ſtir, except perhaps a withered leaf dropping gently through a tree; and, ſheltered from the chill, to catch the freſhneſs of the evening air: a ſolitary urn, choſen by Mr Pope for the ſpot, and now inſcribed to his memory, when ſhown by a gleam of moonlight through the trees, fixes that thoughtfulneſs and compoſure to which the mind is inſenſibly led by the reſt of this elegant ſcene.

The Doric portico, which alſo bears his name, though not within ſight, is near: it is placed on the declivity of a hill; and Thomſon's ſeat, with its groves and appendages, are agreeable circumſtances in the proſpect before it. In the valley beneath is fixed a bench, which commands a variety of ſhort views; one is up the aſcent to the portico, and other through openings in the wood to the bridge and the rotunda.

The next lawn is large: the ground is ſteep and irregular, but inclines to one direction, and falls from every ſide into the general declivity: the outline is diverſified by many groups of trees on the ſlopes; and frequent glimpſes of the country are ſeen in perſpective through openings between them. In the brow is a ſeat, in the proudeſt ſituation of all Hagley; it commands a view down the bold ſweep of the lawn, and over a valley filled with the nobleſt trees, up to the heights beyond. One of thoſe heights is covered with a hanging wood; which opens only to ſhow Thomſon's ſeat, and the groves and the ſteeps about it; the others are the Witchberry hills, which ſeem to preſs forward into the landſcape; and the maſſy heads of the trees in the vale, uniting into a continued ſurface, form a broad baſe to the temple of Theſeus, hide the ſwell on which it is built, and crowd up to the very foundation. Farther back ſtands the obeliſk; before it is the ſheep walk; behind it the Witchberry wood. The temple is backed by the firs; and both theſe plantations are connected with that vaſt ſylvan ſcene which overſpreads the other hill and all the intermediate valley. Such extent of wood; ſuch variety in the diſpoſition of it; objects ſo illuſtrious in themſelves, and ennobled by their ſituations, each contraſted to each, every one diſtinct, and all happily united: the parts ſo beautiful of a whole ſo great, ſeen from a charming lawn, and ſurrounded by a delightful country, compoſe all together a ſcene of real magnificence and grandeur.

The ſeveral lawns are ſeparated by the fineſt trees; which ſometimes grow in airy groves, chequered with gleams of light, and open to every breeze; but more frequently, whoſe great branches meeting or croſſing each other, caſt a deep impenetrable ſhade. Large boughs feathering down often intercept the ſight; or a vacant ſpace is filled with coppice wood, nut, hawthorn, and hornbeam, whoſe tufted heads mixing with the foliage, and whoſe little ſtems cluſtering about the trunks of the trees, thicken and darken the plantation. Here and there the diviſion is of ſuch coppice wood only, which then being leſs conſtrained and oppreſſed, ſprings up ſtronger, ſpreads further, and joins in a low vaulted covering: in other places the ſhade is high, overarched by the talleſt aſh, or ſpreads under the branches of the moſt venerable oaks. They riſe in every ſhape, they are diſpoſed in every form in which trees can grow. The ground beneath them is ſometimes almoſt level; ſometimes a gentle ſwell; but generally very irregular and broken. In ſeveral places, large hollows wind down the ſides of the hills, worn in the ſtormy months by water courſes but worn many ages ago. Very old oaks in the midſt of the channels prove their antiquity: ſome of them are perfectly dry moſt part of the year; and ſome are watered by little rills all the ſummer: they are deep and broad; the ſides are commonly ſteep; often abrupt and hollow; and the trees on the bank ſometimes extend their roots, all covered with moſs, over the channels of the water. Low down in one of theſe glens, under a thick ſhade of horſe cheſnuts, is a plain bench, in the midſt of ſeveral little currents and water falls, running among large looſe ſtones, and the ſtumps of dead trees, with which the ground is broken. On the brink of another glen, which is diſtinguiſhed by a numerous rookery, is a ſeat in a ſtill wilder ſituation, near a deeper hollow, and in a darker gloom: the falls are nearly perpendicular; the roots of ſome of the trees are almoſt bare, from the earth having crumbled away ; large boughs of others, ſinking with their own weight, ſeem ready to break from the trunks they belong to ; and the fineſt aſh, ſtill growing, lie all aſlant the water courſe below, which, though the ſtream runs in winter only, yet conſtantly retains the black tinge of damp, and caſts a chill all around.

Gravel walks are conducted acroſs the glens, through the woods, the groves, or the thickets, and along the ſides of the lawns, concealed generally from the ſight, but always ready for the communication, and leading to the principal ſcenes. The frequency of theſe walks, the number and the ſtyle of the buildings, and the high preſervation in which all the place is kept, give to the whole park the air of a garden. There is, however, one ſpot more peculiarly adapted to that purpoſe, and more artificially diſpoſed than the reſt ; it is a narrow vale, divided into three parts : one of them is quite filled with water, which leaves no room for a path, but thick trees on either ſide come down quite to the brink ; and between them the ſight is conducted to the bridge with a portico upon it, which cloſes the view : another part of this vale is a deep gloom, overhung with large aſh and oaks, and darkened below by a number of yews : theſe are ſcattered over very uneven ground, and open underneath ; but they are encompaſſed by a thick covert, under which a ſtream falls, from a ſtony channel, down a rock ; other rills drop into the current, which afterwards pours over a ſecond caſcade into the third diviſion of the vale, where it forms a piece of water, and is loſt under the bridge. The view from this bridge is a perfect opera ſcene, through all the diviſions of the vale up to the rotunda. Both theſe buildings, and the other decorations of the ſpot, are of the ſpecies generally confined to a garden. The hermitage alſo, which has been deſcribed, and its appendages, are in a ſtyle which does not belong to a park ; but through all the reſt of the place, the two characters are intimately blended. The whole is one ſubject ; and it was a bold idea to conceive that one to be capable of ſo much variety ; it required the moſt vigorous efforts of a fertile fancy to carry that idea into execution. See GARDENING.

Park of Artillery. See ARTILLERY.

Park of Proviſions, in military affairs, the place where the ſutlers pitch their tents in the rear, and ſell their proviſions to the ſoldiers. Likewiſe that place where the bread waggons are drawn up, and where the troops receive their ammunition bread, being the ſtore of the army.

PARKER (Matthew), the ſecond Proteſtant archbiſhop of Canterbury, was born at Norwich in the year 1504, the 19th of Henry VII. His father, who was a man in trade, died when our author was about 12 years old ; but his mother took ſpecial care of his education, and at the age of 17 ſent him to Corpus Chriſti college in Cambridge, where, in 1523, he took his bachelor's degree. In 1527 he was ordained, created maſter of arts, and choſen fellow of the college. Having obtained a licenſe to preach, he frequently held forth at St Paul's croſs in London, and in other parts of the kingdom. In 1533 or 1534 he was made chaplain to Queen Anne Boleyn, who obtained for him the deanery of Stoke Clare in Suffolk, where he founded a grammar ſchool. After the death of the queen, King Henry made him his own chaplain, and in 1541 prebendary of Ely. In 1544, he was, by the king's command, elected maſter of Corpus Chriſti college, and the following year vice chancellor of the univerſity. In 1547 he loſt the deanery of Stoke, by the diſſolution of that college. In the ſame year he married the daughter of Robert Harleſtone, a Norfolk gentleman.

In the year 1552 he was nominated, by Edward VI. to the deanery of Lincoln, which, with his other preferments, enabled him to live in great affluence : but the papiſt Mary was hardly ſeated on the throne before he was deprived of every thing he held in the church, and obliged to live in obſcurity, frequently changing his place of abode to avoid the fate of the other reformers.

Queen Elizabeth aſcended the throne in 1558 ; and in the following year Dr Parker, from indigence and obſcurity, was at once raiſed to the ſee of Canterbury (A) ; an honour which he neither ſolicited nor deſired. In this high ſtation he acted with ſpirit and propriety. He viſited his cathedral and dioceſe in 1560, 1565, 1570, and 1573. He repaired and beautified his palace at Lambeth at a vaſt expence. The ſum which the repairs of the palace and great hall at Canterbury coſt him was upwards of 1400l. ſterling, which is at leaſt equal to ten times the ſum now-a-days. Both the palace and great hall were in decay, partly through the injuries of time, and partly through that of fire. The hall, built by Archbiſhop Huber in the 12th century, was famous in hiſtory for the great feaſts that had been made there by archbiſhops and abbots in former times ; in particular, at the nuptial feaſts of King Edward I. in 1290 ; at the inſtallation of the abbot of St. Auſtin's in 1309 ; at the enthronization of George Nevill archbiſhop of York in 1464 ; and of Archbiſhop Warham in 1504, when Edward duke of Buckingham acted as lord high ſteward of his houſehold ; and laſtly, for the entertainment given by that archbiſhop in 1519 to the emperor Charles V. Henry VIII. Queen Catherine, &c. In 1565 Archbiſhop Parker gave three entertainments in this hall at Whitſuntide (which laſted three days), on Trinity Sunday, and in aſſize time. At the two firſt of theſe the archbiſhop himſelf ſat in the midſt of the uppermoſt table ; on his left hand the mayor, &c. and ſo

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(A) He was conſecrated December 17. 1559, in Lambeth Chapel, by Barlow biſhop of Chicheſter, Scory biſhop of Hereford, Coverdale biſhop of Exeter, and Hodgkin ſuffragan biſhop of Bedford. This deſerves to be particularly mentioned, becauſe the Romaniſts aſſerted afterwards that he had been conſecrated at the Nag's head inn or tavern in Cheapſide. But this notorious and improbable falſehood hath been fully confuted by Maſon, in his Vindication of the Church of England concerning the Conſecration and Ordination of Biſhops, 1613, folio ; by Bramhall, in his Conſecration of Proteſtant Biſhops vindicated ; and by Courayer, in his Defence of the Validity of Engliſh Ordinations, 1728, 3 vols. 8vo ; and even by many Catholics.

ſo on one ſide of the hall a continued row of men according to their rank filled the other tables; and on his right hand ſat only ſome noble women and ladies of quality, the whole length of the hall, correſponding to the row of men on the other ſide: which order of placing the women was obſerved in honour of the queen. The firſt rank of gueſts being riſen, and the tables cleared, they were furniſhed again, and filled the ſecond time. At the laſt feaſt, which was grander than all the reſt, the archbiſhop entertained the two judges who went that circuit (B), the attorney-general, the high-ſheriff, with all who met at theſe aſſizes, as juſtices of the peace, advocates, and common lawyers, and all the reſt of proctors and attorneys; who all (with a promiſcuous company) in troops came in. The hall was ſet forth with much plate of ſilver and gold, adorned with much tapeſtry of Flanders; and dainties of all ſorts were ſerved in excellent order by none but the archbiſhop's ſervants, the table being often the ſame day furniſhed afreſh with new gueſts: while the ladies were nobly entertained in inner parlours by Mrs Parker, the hall being now filled only with gentlemen. Otherwiſe, at theſe feaſts, it was the archbiſhop's cuſtom, in honour of matrimony, to entertain both men and their wives. Of this noble hall and palace, now within 200 years, there is little or nothing left except a few ruins. On Whitſunday 1570, and the two following days, this archbiſhop feaſted the citizens of Canterbury and their wives in the ſame manner as he had done before: and on Trinity Sunday (after conſecrating Biſhop Curteis of Chicheſter) he made another moſt archiepiſcopal feaſt, inviting another archbiſhop (viz. Grindal of York, who came thither for confirmation) to be his gueſt: beſides whom were preſent Horn biſhop of Wincheſter, and Curteis aforeſaid of Chicheſter. At the lower tables ſat all the miniſters and ſervants whatſoever, even the children, who belonged to that church; and at the remoteſt tables, but in the ſame hall, in ſight, ſat the poor of both ſexes of the hoſpitals of St John's and Harbledown. On July 11th, being aſſizes time, the judges, high-ſheriff, gentlemen, and the common ſort, were all feaſted by the archbiſhop in a ſplendid manner as before. Soon after Biſhop Sandys of Worceſter, elect of London, came to Canterbury to be confirmed. The archbiſhop, on his return, lodged the firſt night at Sittingbourn, and the next night (after dining at Graveſend) came to Lambeth in barges by Thames, with all his family. Sept. 7. 1573, being Q. Elizabeth's birth-day, Archbiſhop Parker entertained her majeſty, and as many noblemen, &c. as were preſent at Archbiſhop Warham's entertainment in the ſame hall 54 years before. The archbiſhop (to uſe his own words, in a letter to Archbiſhop Grindal of York) "met her highneſs, as ſhe was coming to Dover, upon Folkſtone Down. I left her at Dover, and came home to Bekeſborn that night; and after that went to Canterbury to receive her majeſty there. Which I did, with the biſhops of Lincoln and Rocheſter, and my ſuffragan [of Dover], at the weſt door; where, after the grammarian had made his oration to her upon her horſe-back, ſhe alighted. We then kneeled down, and ſaid the pſalm *Deus miſereatur*, in Engliſh, with certain other collects briefly; and that in our chimeres and rochets. The quire, with the dean and prebendaries, ſtood on either ſide of the church, and brought her majeſty up with a ſong; ſhe going under a ſquare canopy, borne by four of her temporal knights, to her traverſe, placed by the communion board, where ſhe heard evening ſong; and after departed to her lodging at St Auſtin's, whither I waited upon her. From thence I brought certain of the council, and divers of the court, to my houſe to ſupper, and gave them 14 or 15 diſhes, furniſhed with two meſs, at my long table, whereat ſat about 20; and in the ſame chamber a third meſs, at a ſquare table, whereat ſat 10 or 12; my leſs hall having three long tables furniſhed with my officers, and with the guard, and others of the court: and ſo her majeſty came every Sunday to church to hear the ſermon. And upon one Monday it pleaſed her highneſs to dine in my great hall, thoroughly furniſhed with the council, Frenchmen, ladies, gentlemen, and the mayor of the town, with his brethren, &c.; her highneſs ſitting in the midſt, having two French ambaſſadors [Gondius and Mothe-Fenelon] at the end of the table, and four ladies of honour at the other end. And ſo three meſs were ſerved by her nobility at waſhing, her gentlemen and guard bringing her diſhes, &c." On which the archbiſhop of York, in his anſwer, made this reflection: "Your grace's large deſcription of the entertainment at Canterbury did ſo lively ſet forth the matter, that in reading thereof I almoſt thought myſelf to be one of your gueſts there, and as it were beholding the whole order of all things done there. Sir, I think it ſhall be hard for any of our coat to do the like for one hundred years, and how long after God knoweth." In this progreſs Lord Treaſurer Burleigh was lodged with Mr Pearſon, the eleventh prebendary, who, the archbiſhop ſays, "had a fine houſe."

He founded ſeveral ſcholarſhips in Bennet or Corpus-Chriſti college in Cambridge, and gave large preſents of plate to that and to other colleges in this univerſity. He gave 100 volumes to the public library. He likewiſe founded a free ſchool at Rochdale in Lancaſhire. He too care to have the ſees filled with pious and learned men; and, conſidering the great want of Bibles in many places, he, with the aſſiſtance of other learned men, improved the Engliſh tranſlation, had it printed on a large paper, and diſperſed through the kingdom. This worthy prelate died in the year 1575, aged 72, and was buried in his own chapel at Lambeth. He was pious without affectation or auſterity, cheerful and contented in the midſt of adverſity, moderate in the height of power, and beneficent beyond example. He wrote ſeveral books; and alſo publiſhed four of our beſt hiſtorians; *Matthew of Weſtminſter*, *Matthew Paris*, *Aſſer's Life of King Alfred*, and *Tho. Walſingham*. The learned archbiſhop alſo tranſlated the Pſalter. This verſion was printed, but without a name; and has been

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(B) This proves that the judges of aſſize then came to Canterbury, though it was then a county in itſelf, being ſo made in 1461.

Parker. attributed to an obſcure poet of the name of Keeper. This was Wood's opinion; but it is more than probable that the learned author of the *Athenæ Oxon.* was wrong. See Gentleman's Magazine for 1781, p. 566. where Parker is proved to be the author of a verſion of the Pſalms.

Parker (Samuel), an Engliſh clergyman, who, by a temporizing ſpirit, aided by excellent parts and conſiderable learning, raiſed himſelf to the biſhopric of Oxford. He was born September 1640, at Northampton, where his father John then practiſed the law. John had been bred to that profeſſion, in one of the temples at London; and, being afterwards againſt the king, was made a member of the high court of juſtice in 1649, where he gave ſentence againſt the three lords, Capel, Holland, and Hamilton, who were beheaded. During Cromwell's uſurpation, he was made an aſſiſtant committee man for his county. In 1650 he publiſhed a book in defence of the new government, as a commonwealth, without a king or houſe of lords. June 1655, when Cromwell was declared protector, he was appointed a commiſſioner for removing obſtructions at Worceſter houſe in the Strand, near London, and was ſworn ſerjeant at law next day. January 1659, he was appointed one of the barons of the exchequer by the Rump parliament; but, upon a complaint againſt him, was quickly diſplaced. However, he was again regularly made ſerjeant at law, on the recommendation of Chancellor Hyde, at the firſt call after the Reſtoration. In the mean time, he carefully educated his ſon Samuel among the Puritans in Northampton; whence, being fit for the univerſity, he was ſent to Wadham college in Oxford, and admitted, in 1659, under a Preſbyterian tutor. Here he led a ſtrict and religious life, entered into a weekly ſociety, then called the *Gruellers*, becauſe (as Wood obſerves) their chief diet was watergruel; and it was obſerved that he put more graves in his porridge than all the reſt. They faſted and prayed, and met at a houſe at Halywell, where he was ſo zealous and conſtant at prayers, ſermons, and ſacraments, that he was eſteemed one of the moſt precious young men in the univerſity. He took the degree of A. B. February 28. 1659-60. Upon the Reſtoration, he heſitated what ſide to take; but continuing publicly to ſpeak againſt Epiſcopacy, he was much diſcountenanced by the new warden Dr Blandford, who had been appointed to that office upon the dawn of the Reſtoration in 1659. Upon this he removed to Trinity college, where, by the advice of Dr Ralph Ruthwell, then a ſenior fellow of that ſociety, he was reſcued from the prejudices of an unhappy education, which in fact he publicly avowed in print. He then became a zealous Anti-puritan, and for many years acted the part of what was then called a true ſon of the church. In this temper, having taken the degree of M. A. in 1663, he entered into holy orders, reſorted frequently to London, and became chaplain to a nobleman; continuing to diſplay his wit upon his old friends the Preſbyterians, Independents, &c.

In 1665, he publiſhed ſome Philoſophical Eſſays, and was elected a member of the Royal Society; theſe Eſſays, he dedicated to Sheldon archbiſhop of Canterbury, who became his patron; and in 1667 made him his chaplain. Being thus in the road to preferment, he left Oxford, and reſided at Lambeth, under the eye of his patron; who, in 1670, made him archdeacon of Canterbury, in the room of Dr Sancroft, afterwards archbiſhop. November the ſame year, he put himſelf in the train of William prince of Orange, who viſited Cambridge, and had the degree of D. D. conferred upon him there. November 1672, he was inſtalled a prebendary of Canterbury; and was made rector of Ickham and Chatham in Kent by the archbiſhop much about the ſame time. He was very obſequious to the court during the reign of Charles II. and upon the acceſſion of his brother to the throne, he continued the ſame ſervile complaiſance; and he ſoon reaped the fruits of it in the biſhopric of Oxford, to which he was appointed by James II. on the death of Dr Fell in 1686, being allowed to hold the archdeaconry of Canterbury in commendam. He was likewiſe made a privy counſellor, and conſtituted by a royal mandamus preſident of Magdalen college in Oxford. Theſe favours, however, were the price of his religion, which he ſcrupled not to offer up a ſacrifice to his ambition. In this new change, he became one of the Romiſh mercenaries, proſtituting his pen in defending tranſubſtantiation, and the worſhip of ſaints and images. The Papiſts made ſure of him as a proſelyte; one of whom ſays that he even propoſed in council, whether it was not expedient, that at leaſt one college in Oxford ſhould be allowed Catholics, that they might not be forced to be at ſuch charges, by going abroad to ſtudy. In the ſame way, having invited two Popiſh noblemen, and one of the church of England, to an entertainment, he drank the king's health, wiſhing a happy ſucceſs to all his affairs; adding, that the Proteſtant religion in England ſeemed to him to be in no better a condition than that of Buda was before it was taken, and that they were next to Atheiſts who dared to defend that faith. Nay, ſo ſhameful was his conduct, that the cooler among the Romaniſts condemned it as too hot and precipitate. For example, Father Peter, a Jeſuit, and privy counſellor to King James, in a letter to Father la Chaiſe, confeſſor to Louis XIV. writes thus: "The biſhop of Oxford has not yet declared himſelf openly; the great obſtacle is his wife, whom he cannot rid himſelf of; his deſign being to continue a biſhop, and only change communion, as it is not doubted but the king will permit, and our holy father confirm; though I don't ſee how he can be farther uſeful to us in the religion he is in; becauſe he is ſuſpected, and of no eſteem among the heretics of the Engliſh church: nor do I ſee that the example of his converſion is like to draw many others after him, becauſe he declared himſelf ſo ſuddenly. If he had believed my counſel, which was to temporize for ſome longer time, he would have done better; but it is his temper, or rather zeal, that hurried him on to it." Accordingly his authority in his dioceſe was ſo very inſignificant, that when he aſſembled his clergy, and deſired them to ſubſcribe an "Addreſs of Thanks to the King for his Declaration of Liberty of Conſcience," they rejected it ſo unanimouſly, that he got but one clergyman to concur with him in it. Biſhop Burnet repreſents him to be a man of no judgment, and of as little virtue; and as to religion rather impious: that he was covetous and ambitious, and ſeemed to have no other ſenſe of religion but as a political intereſt, and a ſubject of party and faction. He ſeldom came to prayers, or to any exerciſes of devotion; and was ſo proud, that he grew inſufferable to all that came near him. (But this muſt be read with caution.) No doubt but the ill ſucceſs he met with, in puſhing on the deſign to introduce Popery, ruined him, as well as his royal maſter: the latter loſt his crown by it, and the biſhop his life; for, falling into contempt with all good men, trouble of mind threw him into a diſtemper, of which he died unlamented at Magdalen college, March 20. 1687. He ſent, however, a Diſcourſe to James, perſuading him to embrace the Proteſtant religion, with a Letter to the ſame purpoſe, which was printed at London in 1690, 4to. He wrote ſeveral pieces, in all which Burnet allows that there was an entertaining livelineſs; though at the ſame time he accompanies that favourable cenſure, as his manner is, with a "But it was neither grave nor correct." Yet Dr Nichols's remark cannot be diſputed, and may be extended to the preſent time, "that he has but few readers at this day." And Swift obſerves, that Marvell's remarks on Parker continued to be read, when the book which occaſioned them was long ago ſunk. He left a ſon, Samuel, an excellent ſcholar, and of ſingular modeſty; who married a bookſeller's daughter at Oxford, where he reſided with a numerous family of children; to ſupport which, he publiſhed ſome books, with a modeſt Vindication of his father. One of his ſons is now, or was lately, a bookſeller at Oxford.

PARKINSONIA, ſo called in honour of the Engliſh botaniſt *Parkinſon:* A genus of the monogynia order, belonging to the decandria claſs of plants; and in the natural method it ranks under the 33d order, *Lomentaceæ.* The calyx is quinquefid; there are five petals, all of them oval except the loweſt, which is reniform; there is no ſtyle; the legumen moniliform, or like ſtrong beads. We know but one ſpecies of this plant, which is very common in the Spaniſh Weſt Indies, but has of late years been introduced into the Engliſh ſettlements, for the beauty and ſweetneſs of its flowers. In the countries where it grows naturally, it riſes to be a tree of 20 or more feet high, and bears long ſlender bunches of yellow flowers; which have a moſt agreeable ſweet ſcent.

PARLEY, a conference with an enemy. Hence, to beat or ſound a parley, is to give a ſignal for holding ſuch a conference by beat of drum, or ſound of trumpet.

Definition. PARLIAMENT, the grand aſſembly of the three ſtates of this kingdom, ſummoned together by the king's authority, to conſider of matters relating to the public welfare, and particularly to enact and repeal laws.

Origin not certainly known. The original or firſt inſtitution of parliament is one of thoſe matters which lie ſo far hidden in the dark ages of antiquity, that the tracing of it out is a thing equally difficult and uncertain. The word *parliament* itſelf (or *colloquium*, as ſome of our hiſtorians tranſlate it) is, comparatively, of modern date; derived from the French, and ſignifying "the place where they met and conferred together." It was firſt applied to general aſſemblies of the ſtates under Lewis VII. in France, about the middle of the 12th century. But it is certain, that long before the introduction of the Norman language into England, all matters of importance were debated and ſettled in the great councils of the realm. A practice which ſeems to have been univerſal among the northern nations, particularly the Germans; and carried by them into all the countries of Europe, which they overran at the diſſolution of the Roman empire. Relicks of which conſtitution, under various modifications and changes, are ſtill to be met with in the diets of Poland, Germany, and Sweden, and lately in the aſſembly of the eſtates in France: for what is there now called the *parliament*, is only the ſupreme court of juſtice, conſiſting of the peers, certain dignified eccleſiaſtics, and judges; which neither is in practice, nor is ſuppoſed to be in theory, a general council of the realm.

3 Antiquity of, in England. In England, however, this general council hath been held immemorially, under the ſeveral names of *michel-ſynoth*, or "great council;" *michel-gemote* or "great meeting;" and more frequently *wittena-gemote*, or "the meeting of wiſe men." It was alſo ſtyled in Latin, *commune concilium regni, magnum concilium regis, curia magna, conventus magnatum vel procerum aſſiſa generalis*, and ſometimes *communitas regni Angliæ.* We have inſtances of its meeting to order the affairs of the kingdom, to make new laws, and to amend the old, or, as Fleta expreſſes it, *novis injuriis emerſis nova conſtituere remedia*, ſo early as the reign of Ina king of the Weſt Saxons, Offa king of the Mercians, and Ethelbert king of Kent, in the ſeveral realms of the heptarchy. And after their union, the Mirrour informs us, that King Alfred ordained for a perpetual uſage, that theſe councils ſhould meet twice in the year, or oftener, if need be, to treat of the government of God's people; how they ſhould keep themſelves from ſin, ſhould live in quiet, and ſhould receive right. Our ſucceeding Saxon and Daniſh monarchs held frequent councils of this ſort, as appears from their reſpective codes of laws; the titles whereof uſually ſpeak them to be enacted, either by the king with the advice of his *wittena-gemote*, or wiſe men, as, *Hæc ſunt inſtituta, quæ Edgarus rex conſilio ſapientium ſuorum inſtituit;* or to be enacted by thoſe ſages with the advice of the king; as, *Hæc ſunt judicia, quæ ſapientes conſilio regis Ethelſtani inſtituerunt;* or, laſtly, To be enacted by them both together, as *Hæ ſunt inſtitutiones, quas rex Edmundus et epiſcopi ſui cum ſapientibus ſuis inſtituerunt.*

There is alſo no doubt but theſe great councils were occaſionally held under the firſt princes of the Norman line. Glanvil, who wrote in the reign of Henry II. ſpeaking of the particular amount of an amercement in the ſheriff's court, ſays, it had never yet been aſcertained by the general aſſize or aſſembly, but was left to the cuſtom of particular counties. Here the general aſſize is ſpoken of as meeting well known, and its ſtatutes or deciſions are put in a manifeſt contradiſtinction to cuſtom, or the common law. And in Edward III.'s time, an act of parliament, made in the reign of William the Conqueror, was pleaded in the caſe of the abbey of St Edmund's Bury, and judicially allowed by the court.

Hence it indiſputably appears, that parliaments, or general councils, are coeval with the kingdom itſelf. How thoſe parliaments were conſtituted and compoſ-

The nature of theſe early parliaments not eaſily known.

ed, is another queſtion, which has been matter of great diſpute among our learned antiquarians; and particularly, whether the commons were ſummoned at all; or, if ſummoned, at what period they began to form a diſtinct aſſembly. But without entering into controverſies of this ſort, it may be ſufficient to obſerve, that it is generally agreed, that in the main the conſtitution of parliament, as it now ſtands, was marked out ſo long ago as the 17th year of King John, A. D. 1215, in the great charter granted by that prince; wherein he promiſes to ſummon all archbiſhops, biſhops, abbots, earls, and greater barons, perſonally; and all other tenants in chief under the crown, by the ſheriff and bailiffs; to meet at a certain place, with 40 days notice, to aſſeſs aids and ſcutages when neceſſary. And this conſtitution has ſubſiſted in fact at leaſt from the year 1266, 49 Henry III. there being ſtill extant writs of that date, to ſummon knights, citizens, and burgeſſes, to parliament. We proceed therefore to inquire wherein conſiſts this conſtitution of parliament, as it now ſtands, and has ſtood, for the ſpace of at leaſt 500 years. And in the proſecution of this inquiry, we ſhall conſider, firſt, The manner and time of its aſſembling: Secondly, Its conſtituent parts: Thirdly, The laws and cuſtoms relating to parliament: Fourthly, The methods of proceeding, and of making ſtatutes, in both houſes: And, laſtly, The manner of the parliament's adjournment: prorogation, and diſſolution.

5 Parliament ſummoned only by the king.

I. *As to the manner and time of aſſembling.* The parliament is regularly to be ſummoned by the king's writ or letter, iſſued out of chancery by advice of the privy council, at leaſt 40 days before it begins to ſit. It is a branch of the royal prerogative, that no parliament can be convened by its own authority, or by the authority of any, except the king alone. And this prerogative is founded upon very good reaſon. For, ſuppoſing it had a right to meet ſpontaneouſly, without being called together, it is impoſſible to conceive that all the members, and each of the houſes, would agree unanimouſly upon the proper time and place of meeting: and if half of the members met, and half abſented themſelves, who ſhall determine which is really the legiſlative body, the part aſſembled, or that which ſtays away? It is therefore neceſſary, that the parliament ſhould be called together at a determinate time and place; and, highly becoming its dignity and independence, that it ſhould be called together by none but one of its own conſtituent parts: and, of the three conſtituent parts, this office can only appertain to the king; as he is a ſingle perſon, whoſe will may be uniform and ſteady; the firſt perſon in the nation, being ſuperior to both houſes in dignity; and the only branch of the legiſlature that has a ſeparate exiſtence, and is capable of performing any act at a time when no parliament is in being. Nor is it an exception to this rule, that, by ſome modern ſtatutes, on the demiſe of a king or queen, if there be then no parliament in being, the laſt parliament revives, and is to ſit again for ſix months, unleſs diſſolved by the ſucceſſor: for this revived parliament muſt have been originally ſummoned by the crown.

6 The convention parliament no juſt exception to this;

It is true, that the convention parliament which reſtored King Charles II. met above a month before his return; the lords by their own authority, and the commons in purſuance of writs iſſued in the name of the keepers of the liberty of England by authority of parliament; and that the ſaid parliament ſat till the 29th of December, full ſeven months after the Reſtoration; and enacted many laws, ſeveral of which are ſtill in force. But this was for the neceſſity of the thing, which ſuperſedes all law; for if they had not ſo met, it was morally impoſſible that the kingdom ſhould have been ſettled in peace. And the firſt thing done after the king's return was, to paſs an act declaring this to be a good parliament, notwithſtanding the defect of the king's writ. So that as the royal prerogative was chiefly wounded by their ſo meeting, and as the king himſelf, who alone had a right to object, conſented to wave the objection, this cannot be drawn into an example in prejudice of the rights of the crown. Beſides, we ſhould alſo remember, that it was at that time a great doubt among the lawyers, whether even this healing act made it a good parliament, and held by very many in the negative; though it ſeems to have been too nice a ſcruple. And yet, out of abundant caution, it was thought neceſſary to confirm its acts in the next parliament, by ſtatute 13 Car. II. c. 7. and c. 14.

7 nor that of 1688, becauſe they originated *ex neceſſitate rei.*

It is likewiſe true, at the time of the Revolution, A. D. 1688, the lords and commons by their own authority, and upon the ſummons of the prince of Orange (afterwards King William), met in a convention, and therein diſpoſed of the crown and kingdom. But it muſt be remembered, that this aſſembling was upon a like principle of neceſſity as at the Reſtoration; that is, upon a full conviction that King James II. had abdicated the government, and that the throne was thereby vacant: which ſuppoſition of the individual members was confirmed by their concurrent reſolution, when they actually came together. And, in ſuch a caſe as the palpable vacancy of a throne, it follows, *ex neceſſitate rei,* that the form of the royal writs muſt be laid aſide, otherwiſe no parliament can ever meet again. For let us put another poſſible caſe, and ſuppoſe, for the ſake of argument, that the whole royal line ſhould at any time fail, and become extinct, which would indiſputably vacate the throne: in this ſituation it ſeems reaſonable to preſume, that the body of the nation, conſiſting of lords and commons, would have a right to meet and ſettle the government; otherwiſe there muſt be no government at all. And upon this and no other principle did the convention in 1688 aſſemble. The vacancy of the throne was precedent to their meeting without any royal ſummons, not a conſequence of it. They did not aſſemble without writ, and then make the throne vacant; but, the throne being previouſly vacant by the king's abdication, they aſſembled without writ, as they muſt do if they aſſembled at all. Had the throne been full, their meeting would not have been regular: but, as it was really empty, ſuch meeting became abſolutely neceſſary. And accordingly it is declared by ſtatute 1 W. & M. ſtat. 1. c. 1. that this convention was really the two houſes of parliament, notwithſtanding the want of writs or other defects of form. So that, notwithſtanding theſe two capital exceptions, which were juſtifiable only on a principle of neceſſity (and each of which, by the way, induced a revolution in the government), the rule laid down is in general certain, that the king only can convoke a parliament.

8 The king is obliged to convoke parliament as often as circumſtances require.

And this, by the ancient ſtatutes of the realm, he is bound to do every year, or oftener if need be. Not that he is, or ever was, obliged by theſe ſtatutes to call a new parliament every year; but only to permit a parliament to ſit annually for the redreſs of grievances, and deſpatch of buſineſs, if need be. Theſe laſt words are ſo looſe and vague, that ſuch of our monarchs as were inclined to govern without parliaments, neglected the convoking them, ſometimes for a very conſiderable period, under pretence that there was no need of them. But, to remedy this, by the ſtatute 16 Car. II. c. 1. it is enacted, that the ſitting and holding of parliaments ſhall not be intermitted above three years at the moſt. And by the ſtatute 1 W. & M. ſt. 2. c. 2. it is declared to be one of the rights of the people, that for redreſs of all grievances, and for the amending, ſtrengthening, and preſerving, the laws, parliaments ought to be held frequently. And this indefinite frequency is again reduced to a certainty by ſtatute 6 W & M. c. 2. which enacts, as the ſtatute of Charles II. has done before, that a new parliament ſhall be called within three years after the determination of the former.

9 The king, lords ſpiritual and temporal, and commons, make the parliament.

II. *The conſtituent parts of a parliament are*, the king's majeſty, ſitting there in his royal political capacity, and the three eſtates of the realm; the lords ſpiritual, the lords temporal (who ſit together with the king in one houſe), and the commons, who ſit by themſelves in another. And the king and theſe three eſtates together form the greater corporation or body politic of the kingdom, of which the king is ſaid to be *caput, principium, et finis*. For upon their coming together the king meets them, either in perſon or by repreſentation; without which there can be no beginning of a parliament; and he alſo has alone the power of diſſolving them.

10 The propriety and neceſſity of the king's being a branch of the legiſlature.

It is highly neceſſary for preſerving the balance of the conſtitution, that the executive power ſhould be a branch, though not the whole, of the legiſlature. The total union of them, we have ſeen, would be productive of tyranny; the total disjunction of them, for the preſent, would in the end produce the ſame effects, by cauſing that union againſt which it ſeems to provide. The legiſlature would ſoon become tyrannical, by making continual encroachments, and gradually aſſuming to itſelf the rights of the executive power. Thus the long parliament of Charles I. while it acted in a conſtitutional manner, with the royal concurrence, redreſſed many heavy grievances and eſtabliſhed many ſalutary laws. But when the two houſes aſſumed the power of legiſlation, in excluſion of the royal authority, they ſoon after aſſumed likewiſe the reins of adminiſtration; and, in conſequence of theſe united powers, overturned both church and ſtate, and eſtabliſhed a worſe oppreſſion than any they pretended to remedy. To hinder therefore any ſuch encroachments, the king is himſelf a part of the parliament; and as this is the reaſon of his being ſo, very properly therefore the ſhare of legiſlation which the conſtitution has placed in the crown, conſiſts in the power of rejecting, rather than reſolving; this being ſufficient to anſwer the end propoſed. For we may apply to the royal negative, in this inſtance, what Cicero obſerves of the negative of the Roman tribunes, that the crown has not any power of doing wrong, but merely of preventing wrong from being done. The crown cannot begin of itſelf any alterations in the preſent eſtabliſhed law; but it may approve or diſapprove of the alterations ſuggeſted and conſented to by the two houſes. The legiſlature therefore cannot abridge the executive power of any rights which it now has by law, without its own conſent; ſince the law muſt perpetually ſtand as it now does, unleſs all the powers will agree to alter it. And herein indeed conſiſts the true excellence of the Britiſh government, that all the parts of it form a mutual check upon each other. In the legiſlature, the people are a check upon the nobility, and the nobility a check upon the people, by the mutual privilege of rejecting what the other has reſolved; while the king is a check upon both, which preſerves the executive power from encroachments. And this very executive power is again checked and kept within due bounds by the two houſes, through the privilege they have of inquiring into, impeaching, and puniſhing the conduct (not indeed of the king, which would deſtroy his conſtitutional independence; but which is more beneficial to the public) of his evil and pernicious counſellors. Thus every branch of our civil polity ſupports and is ſupported, regulates and is regulated, by the reſt: for the two houſes naturally drawing in two directions of oppoſite intereſt, and the prerogative in another ſtill different from them both, they mutually keep each other from exceeding their proper limits; while the whole is prevented from ſeparation, and artificially connected together by the mixed nature of the crown, which is a part of the legiſlative, and the ſole executive magiſtrate. Like three diſtinct powers in mechanics, they jointly impel the machine of government in a direction different from what either, acting by itſelf, would have done; but at the ſame time in a direction partaking of each, and formed out of all; a direction which conſtitutes the true line of the liberty and happineſs of the community.

Having already conſidered theſe conſtituent parts of the ſovereign power, or parliament, each in a ſeparate view, under the articles King, Lords, and Commons, to which the reader is referred, we proceed,

11 The power of parliament.

III. To examine the laws and cuſtoms relating to parliament, united together and conſidered as one aggregate body. The power and juriſdiction of parliament, ſays Sir Edward Coke, is ſo tranſcendent and abſolute, that it cannot be confined either for cauſes or perſons within any bounds. And of this high court he adds, it may be truly ſaid, *Si antiquitatem ſpectes, eſt vetuſtiſſima; ſi dignitatem, eſt honoratiſſima; ſi juriſdictionem, eſt capaciſſima.* It hath ſovereign and uncontroulable authority in making, confirming, enlarging, reſtraining, abrogating, repealing, reviving, and expounding of laws, concerning matters of all poſſible denominations, eccleſiaſtical or temporal, civil, military, maritime, or criminal: this being the place where that abſolute deſpotic power, which muſt in all governments reſide ſomewhere, is intruſted by the conſtitution of theſe kingdoms. All miſchiefs and grievances, operations and remedies, that tranſcend the ordinary courſe of the laws, are within the reach of this extraordinary tribunal. It can regulate or new-model the ſucceſſion to the crown; as was done in the reign of Henry VIII. and William III. It can alter the eſtabliſhed religion of the land; as was done in a variety of inſtances in the reigns of King Henry VIII. and his three children. It can change and create afreſh even the conſtitution of the kingdom and of parliaments themſelves; as was done by the act of Union, and the ſeveral ſtatutes for triennial and ſeptennial elections. It can, in ſhort, do every thing that is not naturally impoſſible; and therefore ſome have not ſcrupled to call its power, by a figure rather too bold, the *omnipotence of parliament*. True it is, that what the parliament doth, no authority upon earth can undo. So that it is a matter moſt eſſential to the liberties of this kingdom, that ſuch members be delegated to this important truſt as are moſt eminent for their probity, their fortitude, and their knowledge; for it was a known apophthegm of the great lord treaſurer Burleigh, "That England could never be ruined but by a parliament; and, as Sir Matthew Hale obſerves, this being the higheſt and greateſt court, over which none other can have juriſdiction in the kingdom, if by any means a miſgovernment ſhould anyway fall upon it, the ſubjects of this kingdom are left without all manner of remedy. To the ſame purpoſe the Preſident Monteſquieu, though we truſt too haſtily, preſages, that as Rome, Sparta, and Carthage, have loſt their liberty and periſhed; ſo the conſtitution of England will in time loſe its liberty, will periſh: it will periſh whenever the legiſlative power ſhall become more corrupt than the executive.

12 Mr Locke's opinion reſpecting this power.

It muſt be owned, that Mr Locke, and other theoretical writers, have held, that "there remains ſtill inherent in the people a ſupreme power to remove or alter the legiſlature, when they find the legiſlature act contrary to the truſt repoſed in them: for when ſuch truſt is abuſed, it is thereby forfeited, and devolves to thoſe who gave it." But however juſt this concluſion may be in theory, we cannot adopt it, nor argue from it, under any diſpenſation of government at preſent actually exiſting. For this devolution of power, to the people at large, includes in it a diſſolution of the whole form of government eſtabliſhed by that people; reduces all the members to their original ſtate of equality; and by annihilating the ſovereign power, repeals all poſitive laws whatſoever before enacted. No human laws will therefore ſuppoſe a caſe, which at once muſt deſtroy all law, and compel men to build afreſh upon a new foundation; nor will they make proviſion for ſo deſperate an event, as muſt render all legal proviſions ineffectual. So long therefore as the Engliſh conſtitution laſts, we may venture to affirm, that the power of parliament is abſolute and without controul.

13 The qualifications of members.

In order to prevent the miſchiefs that might ariſe, by placing this extenſive authority in hands that are either incapable or elſe improper to manage it, it is provided by the cuſtom and law of parliament, that no one ſhall ſit or vote in either houſe, unleſs he be 21 years of age. This is alſo expreſsly declared by ſtatute 7 & 8 W. III. c. 25. with regard to the houſe of commons, doubts have ariſen, from ſome contradictory adjudications, whether or not a minor was incapacitated from ſitting in that houſe. It is alſo enacted by ſtatute 7 Jac. I. c. 6. that no member be permitted to enter the houſe of commons till he hath taken the oath of allegiance before the lord ſteward or his deputy: and by 30 Car. II. ſt. 2. and 1 Geo. I. c. 13. that no member ſhall vote or ſit in either houſe, till he hath, in the preſence of the houſe, taken the oaths of allegiance, ſupremacy, and abjuration, and ſubſcribed and repeated the declaration againſt tranſubſtantiation, and invocation of ſaints, and the ſacrifice of the maſs. Aliens, unleſs naturalized, were likewiſe by the law of parliament incapable to ſerve therein: and now it is enacted, by ſtatute 12 & 13 W. III. c. 2. that no alien, even though he be naturalized ſhall be capable of being a member of either houſe of parliament. And there are not only theſe ſtanding incapacities; but if any perſon is made a peer by the king, or elected to ſerve in the houſe of commons by the people, yet may the reſpective houſes, upon complaint of any crime in ſuch perſon, and proof thereof, adjudge him diſabled and incapable to ſit as a member: and this by the law and cuſtom of parliament.

14 The cuſtoms of parliament which are not ſanctioned by expreſs laws.

For as every court of juſtice hath laws and cuſtoms for its direction, ſome the civil and canon, ſome the common law, others their own peculiar laws and cuſtoms; ſo the high court of parliament hath alſo its own peculiar law, called the *lex et conſuetudo parliamenti;* a law which Sir Edward Coke obſerves is *ab omnibus quærenda, à multis ignorata, à paucis cognita.* It will not therefore be expected that we ſhould enter into the examination of this law with any degree of minuteneſs; ſince, as the ſame learned author aſſures us, it is much better to be learned out of the rolls of parliament and other records, and by precedents and continual experience, than can be expreſſed by any one man. It will be ſufficient to obſerve, that the whole of the law and cuſtom of parliament has its original from this one maxim, "That whatever matter ariſes concerning either houſe of parliament, ought to be examined, diſcuſſed, and adjudged in that houſe to which it relates, and not elſewhere." Hence, for inſtance, the lords will not ſuffer the commons to interfere in ſettling the election of a peer of Scotland; the commons will not allow the lords to judge of the election of a burgeſs; nor will either houſe permit the ſubordinate courts of law to examine the merits of either caſe. But the maxims upon which they proceed, together with the method of proceeding, reſt entirely in the breaſt of the parliament itſelf; and are not defined and aſcertained by any particular ſtated laws.

15 Its extenſive privileges.

The privileges of parliament are likewiſe very large and indefinite; and therefore, when in 31ſt Hen. VI. the houſe of lords propounded a queſtion to the judges concerning them, the chief juſtice, Sir John Forteſcue, in the name of his brethren, declared, "That they ought not to make anſwer to that queſtion; for it hath not been uſed aforetime, that the juſtices ſhould in anywiſe determine the privileges of the high court of parliament; for it is ſo high and mighty in its nature, that it may make law; and that which is law, it may make no law; and the determination and knowledge of that privilege belongs to the lords of parliament, and not to the juſtices." Privilege of parliament was principally eſtabliſhed, in order to protect its members not only from being moleſted by their fellow-ſubjects, but alſo more eſpecially from being oppreſſed by the power of the crown. If therefore all the privileges of parliament were once to be ſet down and aſcertained, and no privilege to be allowed but what was ſo defined and determined, it were eaſy for the executive power to deviſe ſome new caſe, not within the line of privilege, and under pretence thereof to haraſs any refractory member, and violate the freedom of parliament. The dignity and independence of the two houſes are therefore in great meaſure preſerved by keeping their privileges indefinite. Some, however, of the more notorious privileges of the members of either houſe are, privileges of ſpeech, of perſon, of their domeſtics, and of their lands and goods. As to the firſt, privilege of ſpeech, it is declared by the ſtatute 1 W. and M. ſt. 2. c. 2. as one of the liberties of the people, "That the freedom of ſpeech, and debates, and proceedings in parliament, ought not to be impeached or queſtioned in any court or place out of parliament." And this freedom of ſpeech is particularly demanded of the king in perſon, by the ſpeaker of the houſe of commons, at the opening of every new parliament. So likewiſe are the other privileges, of perſon, ſervants, lands, and goods; which are immunities as ancient as Edward the Confeſſor: in whoſe laws we find this precept, *ad ſynodos venientibus, ſive ſummoniti ſint, ſive per ſe quid agendum habuerint, ſit ſumma pax;* and ſo too in the old Gothic conſtitutions, *Extenditur hæc pax et ſecuritas ad quatuordecim dies, convocato regni ſenatu.* This included formerly not only privilege from illegal violence, but alſo from legal arreſts and ſeizures by proceſs from the courts of law. And ſtill to aſſault by violence a member of either houſe, or his menial ſervants, is a high contempt of parliament, and there puniſhed with the utmoſt ſeverity. It has likewiſe peculiar penalties annexed to it in the courts of law by the ſtatutes 5 Hen. IV. c. 6. and 11 Hen. VI. c. 11. Neither can any member of either houſe be arreſted and taken into cuſtody without a breach of the privilege of parliament.

16
Some privileges aboliſhed.

But all other privileges which derogate from the common law are now at an end, ſave only as to the freedom of the member's perſon; which in a peer (by the privilege of peerage) is for ever ſacred and inviolable; and in a commoner (by the privilege of parliament) for forty days after every prorogation, and forty days before the next appointed meeting; which is now in effect as long as the parliament ſubſiſts, it ſeldom being prorogued for more than 80 days at a time. As to all other privileges which obſtruct the ordinary courſe of juſtice, they were reſtrained by the ſtatutes 12 W. III. c. 3. 2 and 3 Ann. c. 18. and 11 Geo. II. c. 24. and are now totally aboliſhed by ſtatute 10 G. III. c. 50.; which enacts, that any ſuit may at any time be brought againſt any peer or member of parliament, their ſervants, or any other perſon entitled to privilege of parliament; which ſhall not be impeached or delayed by pretence of any ſuch privilege, except that the perſon of a member of the houſe of commons ſhall not thereby be ſubjected to any arreſt or impriſonment. Likewiſe, for the benefit of commerce, it is provided by ſtatute 4 Geo. III. c. 33. that any trader, having privilege of parliament, may be ſerved with legal proceſs for any juſt debt (to the amount of 100l.): and unleſs he makes ſatisfaction within two months, it ſhall be deemed an act of bankruptcy; and that commiſſions of bankruptcy may be iſſued againſt ſuch privileged traders in like manner as againſt any other.

17
Members may be arreſted; but parliament muſt be informed of it, and of the cauſe, &c.

The only way by which courts of juſtice could anciently take cognizance of privilege of parliament was by writ of privilege, in the nature of a *ſuperſedeas*, to deliver the party out of cuſtody when arreſted in a civil ſuit. For when a letter was written by the ſpeaker to the judges, to ſtay proceedings againſt a privileged perſon, they rejected it as contrary to their oath of office. But ſince the ſtatute 12 Will. III. c. 3 which enacts, that no privileged perſon ſhall be ſubject to arreſt or impriſonment, it hath been held, that ſuch arreſt is irregular *ab initio*, and that the party may be diſcharged upon motion. It is to be obſerved, that there is no precedent of any ſuch writ of privilege, but only in civil ſuits; and that the ſtatute of 1 Jac. I. c. 13. and that of King William (which remedy ſome inconveniences ariſing from privilege of parliament), ſpeak only of civil actions. And therefore the claim of privilege hath been uſually guarded with an exception as to the caſe of indictable crimes; or, as it hath been frequently expreſſed, of treaſon, felony, and breach (or ſurety) of the peace. Whereby it ſeems to have been underſtood, that no privilege was allowable to the members, their families, or ſervants, in any *crime* whatſoever; for all crimes are treated by the law as being *contra pacem domini regis*. And inſtances have not been wanting, wherein privileged perſons have been convicted of miſdemeanors, and committed, or proſecuted to outlawry, even in the middle of a ſeſſion; which proceeding has afterwards received the ſanction and approbation of parliament. To which may be added, that a few years ago, the caſe of writing and publiſhing ſeditious libels was reſolved by both houſes not to be entitled to privilege; and that the reaſons upon which that caſe proceeded, extended equally to every indictable offence. So that the chief, if not the only, privilege of parliament, in ſuch caſes, ſeems to be the right of receiving immediate information of the impriſonment or detention of any member, with the reaſon for which he is detained: a practice that is daily uſed upon the ſlighteſt military accuſations, preparatory to a trial by a court martial; and which is recognized by the ſeveral temporary ſtatutes for ſuſpending the *habeas corpus* act: whereby it is provided, that no member of either houſe ſhall be detained, till the matter of which he ſtands ſuſpected be firſt communicated to the houſe of which he is a member, and the conſent of the ſaid houſe obtained for his commitment or detaining. But yet the uſage has uniformly been, ever ſince the Revolution, that the communication has been ſubſequent to the arreſt.

Theſe are the general heads of the laws and cuſtoms relating to parliament, conſidered as one aggregate body. The laws and cuſtoms relating to each branch in particular being explained under the articles already referred to, viz. KING, LORDS, and COMMONS, we ſhould proceed, IV. To the method of making laws; which is much the ſame in both houſes. But for this, too, we have to refer the reader to the article BILL; and ſhall only obſerve in this place, that, for deſpatch of buſineſs, each houſe of parliament has its ſpeaker. The ſpeaker of the houſe of lords, whoſe office it is to preſide there, and manage the formality of buſineſs, is the lord chancellor, or keeper of the king's great ſeal, or any other

18
Of the lord chancellor and ſpeaker of the houſe of commons.

appointed by the king's commiſſion: and if none be ſo appointed, the houſe of lords (it is ſaid) may elect.—The ſpeaker of the houſe of commons is choſen by the houſe; but muſt be approved by the king. And herein the uſage of the two houſes differs, that the ſpeaker of the houſe of commons cannot give his opinion or argue any queſtion in the houſe; but the ſpeaker of the houſe of lords, if a lord of parliament, may. In each houſe the act of the majority binds the whole; and this majority is declared by votes openly and publicly given; not, as at Venice, and many other ſenatorial aſſemblies, privately, or by ballot. This latter method may be ſerviceable, to prevent intrigues and unconſtitutional combinations; but it is impoſſible to be practiſed with us, at leaſt in the houſe of commons, where every member's conduct is ſubject to the future cenſure of his conſtituents, and therefore ſhould be openly ſubmitted to their inſpection.

19
Of the adjournment of parliament.

V. There remains only, in the laſt place, to add a word or two concerning the manner in which parliament may be *adjourned, prorogued*, or *diſſolved*.

An *adjournment* is no more than a continuance of the ſeſſion from one day to another; as the word itſelf ſignifies; and this is done by the authority of each houſe ſeparately every day; and ſometimes for a fortnight or a month together, as at Chriſtmas or Eaſter, or upon other particular occaſions. But the adjournment of one houſe is no adjournment of the other. It hath alſo been uſual, when his majeſty hath ſignified his pleaſure that both or either of the houſes ſhould adjourn themſelves to a certain day, to obey the king's pleaſure ſo ſignified, and to adjourn accordingly.—Otherwiſe, beſides the indecorum of a refuſal, a prorogation would aſſuredly follow; which would often be very inconvenient to both public and private buſineſs. For prorogation puts an end to the ſeſſion; and then ſuch bills as are only begun, and not perfected, muſt be reſumed *de novo* (if at all) in a ſubſequent ſeſſion; whereas, after an adjournment, all things continue in the ſame ſtate as at the time of the adjournment made, and may be proceeded on without any freſh commencement.

20
Of prorogation of parliament

A *prorogation* is the continuance of the parliament from one ſeſſion to another; as an adjournment is a continuation of the ſeſſion from day to day. This is done by the royal authority, expreſſed either by the lord chancellor in his majeſty's preſence, or by commiſſion from the crown, or frequently by proclamation. Both houſes are neceſſarily prorogued at the ſame time; it not being a prorogation of the houſe of lords or commons, but of the parliament. The ſeſſion is never underſtood to be at an end until a prorogation; though, unleſs ſome act be paſſed, or ſome judgment given in parliament, it is in truth no ſeſſion at all. And formerly the uſage was, for the king to give the royal aſſent to all ſuch bills as he approved at the end of every ſeſſion, and then to prorogue the parliament, though ſometimes only for a day or two; after which all buſineſs then depending in the houſes was to be begun again. Which cuſtom obtained ſo ſtrongly, that it once became a queſtion, Whether giving the royal aſſent to a ſingle bill did not of courſe put an end to the ſeſſion? And though it was then reſolved in the negative, yet the notion was ſo deeply rooted, that the ſtatute 1 Car. I. c. 7. was paſſed to declare, that the king's aſſent to that and ſome other acts ſhould not put an end to the ſeſſion; and even ſo late as the reign of Charles II. we find a proviſo frequently tacked to a bill, that his majeſty's aſſent thereto ſhould not determine the ſeſſion of parliament. But it now ſeems to be allowed, that a prorogation muſt be expreſsly made, in order to determine the ſeſſion. And if at the time of an actual rebellion, or imminent danger of invaſion, the parliament ſhall be ſeparated by adjournment or prorogation, the king is empowered to call them together by proclamation, with 14 days notice of the time appointed for their reaſſembling.

21
Parliament is diſſolved by the king's will,

A *diſſolution* is the civil death of the parliament; and this may be effected three ways: 1. By the king's will, expreſſed either in perſon or by repreſentation. For as the king has the ſole right of convening the parliament, ſo alſo it is a branch of the royal prerogative, that he may (whenever he pleaſes) prorogue the parliament for a time, or put a final period to its exiſtence. If nothing had a right to prorogue or diſſolve a parliament but itſelf, it might happen to become perpetual. And this would be extremely dangerous, if at any time it ſhould attempt to encroach upon the executive power; as was fatally experienced by the unfortunate King Charles I.; who, having unadviſedly paſſed an act to continue the parliament then in being till ſuch time as it ſhould pleaſe to diſſolve itſelf, at laſt fell a ſacrifice to that inordinate power which he himſelf had conſented to give them. It is therefore extremely neceſſary that the crown ſhould be empowered to regulate the duration of theſe aſſemblies, under the limitations which the Engliſh conſtitution has preſcribed: ſo that, on the one hand, they may frequently and regularly come together for the deſpatch of buſineſs and redreſs of grievances; and may not, on the other, even with the conſent of the crown, be continued to an inconvenient or unconſtitutional length.

22
or in conſequence of his death,

2. A parliament may be diſſolved by the demiſe of the crown. This diſſolution formerly happened immediately upon the death of the reigning ſovereign: for he being conſidered in law as the head of the parliament, (*caput, principium, et finis*), that failing, the whole body was held to be extinct. But the calling a new parliament immediately on the inauguration of the ſucceſſor being found inconvenient, and dangers being apprehended from having no parliament in being in caſe of a diſputed ſucceſſion, it was enacted by the ſtatutes 7 and 8 Wm. III. c. 15. and 6 Ann, c. 7. that the parliament in being ſhall continue for ſix months after the death of any king or queen, unleſs ſooner prorogued or diſſolved by the ſucceſſor; that if the parliament be, at the time of the king's death, ſeparated, by adjournment or prorogation, it ſhall notwithſtanding aſſemble immediately: and that if no parliament is then in being, the members of the laſt parliament ſhall aſſemble and be again a parliament.

23
or through length of time.

3. Laſtly, A parliament may be diſſolved or expire by length of time. For if either the legiſlative body were perpetual, or might laſt for the life of the prince who convened them as formerly, and were ſo to be ſupplied, by occaſionally filling the vacancies with new repreſentatives; in theſe caſes, if it were once corrupted, the evil would be paſt all remedy; but when different bodies ſucceed each other, if the people ſee cauſe to diſapprove of the preſent, they may rectify its faults

in the next. A legiſlative aſſembly alſo, which is ſure to be ſeparated again, (whereby its members will themſelves become private men, and ſubject to the full extent of the laws which they have enacted for others), will think themſelves bound, in intereſt as well as duty, to make only ſuch laws as are good. The utmoſt extent of time that the ſame parliament was allowed to ſit, by the ſtatute 6 W. and M. c. 3. was *three* years: after the expiration of which, reckoning from the return of the firſt ſummons, the parliament was to have no longer continuance. But by the ſtatute 1 Geo. I. ſt. 2. c. 38. (in order, profeſſedly, to prevent the great and continued expences of frequent elections, and the violent heats and animoſities conſequent thereupon, and for the peace and ſecurity of the government then juſt recovering from the late rebellion), this term was prolonged to *ſeven* years; and, what alone is an inſtance of the vaſt authority of parliament, the very ſame houſe that was choſen for three years, enacted its own continuance for ſeven. So that, as our conſtitution now ſtands, the parliament muſt expire, or die a natural death, at the end of every ſeventh year, if not ſooner diſſolved by the royal prerogative.

We ſhall conclude this article with an account of ſome general forms not taken notice of under any of the above heads.

24
General forms obſerved in the houſe of peers.

In the houſe of lords, the princes of the blood ſit by themſelves on the ſides of the throne; at the wall, on the king's right hand, the two archbiſhops ſit by themſelves on a form. Below them, the biſhops of London, Durham, and Wincheſter, and all the other biſhops, ſit according to the priority of their conſecration. On the king's left hand the lord treaſurer, lord preſident, and lord privy ſeal, ſit upon forms above all dukes, except the royal blood; then the dukes, marquiſſes, and earls, according to their creation. Acroſs the room are wool ſacks, continued from an ancient cuſtom; and the chancellor, or keeper, being of courſe the ſpeaker of the houſe of lords, ſits on the firſt wool ſack before the throne, with the great ſeal or mace lying by him; below theſe are forms for the viſcounts and barons. On the other wool ſacks are ſeated the judges, maſters in chancery, and king's council, who are only to give their advice in points of law; but they all ſtand up till the king gives them leave to ſit.

25
In the houſe of commons.

The commons ſit promiſcuouſly; only the ſpeaker has a chair at the upper end of the houſe, and the clerk and his aſſiſtant ſit at a table near him.

When a member of the houſe of commons ſpeaks, he ſtands up uncovered, and directs his ſpeech to the ſpeaker only. If what he ſays be anſwered by another, he is not allowed to reply the ſame day, unleſs perſonal reflections have been caſt upon him: but when the commons, in order to have a greater freedom of debate, have reſolved themſelves into a committee of the whole houſe, every member may ſpeak to a queſtion as often as he thinks neceſſary. In the houſe of lords they vote, beginning at the puiſne, or loweſt baron, and ſo up orderly to the higheſt, every one anſwering, *Content* or *Not content*. In the houſe of commons they vote by *yeas* and *nays*; and if it be dubious which are the greater number, the houſe divides. If the queſtion be about bringing any thing into the houſe, the *yeas* go out, but if it be about any thing the houſe already has, the *nays* go out. In all diviſions the ſpeaker appoints four tellers, two of each opinion. In a committee of the whole houſe, they divide by changing ſides, the *yeas* taking the right and the *nays* the left of the chair; and then there are but two tellers. If a bill paſs one houſe, and the other demur to it, a conference is demanded in the painted chamber, where certain members are deputed from each houſe; and here the lords ſit covered, and the commons ſtand bare, and debate the caſe. If they diſagree, the affair is null: but if they agree, this, with the other bills that have paſſed both houſes, is brought down to the king in the houſe of lords, who comes thither clothed in his royal robes; before him the clerk of the parliament reads the title of each bill, and as he reads, the clerk of the crown pronounces the royal aſſent or diſſent. If it be a public bill, the royal aſſent is given in theſe words, *Le roy le vaut*, "The king will have it ſo;" if private *Soit fait comme il eſt deſiré*, "Let the requeſt be complied with;" if the king refuſes the bill, the anſwer is, *Le roy s'aviſera*, "The king will think of it;" and if it be a money bill, the anſwer is, *Le roy remercie ſes loyaux ſujets, accepte leur benevolence, et auſſi le veut*; "The king thanks his loyal ſubjects, accepts their benevolence, and therefore grants his conſent."

26
Manner of expreſſing the royal aſſent or diſſent to bills.

High Court of PARLIAMENT, is the ſupreme court in the kingdom, not only for the making, but alſo for the execution, of laws; by the trial of great and enormous offenders, whether lords or commoners, in the method of parliamentary impeachment. As for acts of parliament to attaint particular perſons of treaſon or felony, or to inflict pains and penalties, beyond or contrary to the common law, to ſerve a ſpecial purpoſe, we ſpeak not of them; being to all intents and purpoſes new laws, made *pro re nata*, and by no means an execution of ſuch as are already in being. But an impeachment before the lords by the commons of Great Britain, in parliament, is a proſecution of the already known and eſtabliſhed law, and has been frequently put in practice; being a preſentment to the moſt high and ſupreme court of criminal juriſdiction by the moſt ſolemn grand inqueſt of the whole kingdom. A commoner cannot, however, be impeached before the lords for any capital offence, but only for high miſdemeanors; a peer may be impeached for any crime. And they uſually (in caſe of an impeachment of a peer for treaſon) addreſs the crown to appoint a lord high ſteward, for the greater dignity and regularity of their proceedings; which high ſteward was formerly elected by the peers themſelves, though he was generally commiſſioned by the king; but it hath of late years been ſtrenuouſly maintained, that the appointment of a high ſteward in ſuch caſes is not indiſpenſably neceſſary, but that the houſe may proceed without one. The articles of impeachment are a kind of bills of indictment, found by the houſe of commons, and afterwards tried by the lords; who are in caſes of miſdemeanors conſidered not only as their own peers, but as the peers of the whole nation. This is a cuſtom derived to us from the conſtitution of the ancient Germans; who in their great councils ſometimes tried capital accuſations relating to the public: *Licet apud concilium accuſare quoque, et diſcrimen capitis intendere*. And it has a peculiar propriety in the Engliſh conſtitution; which has much improved upon the

the ancient model imported hither from the continent. For though in general the union of the legiſlative and judicial powers ought to be moſt carefully avoided, yet it may happen that a ſubject, intruſted with the adminiſtration of public affairs, may infringe the rights of the people, and be guilty of ſuch crimes as the ordinary magiſtrate either dares not or cannot puniſh. Of theſe the repreſentatives of the people, or houſe of commons, cannot properly judge; becauſe their conſtituents are the parties injured, and can therefore only impeach. But before what court ſhall this impeachment be tried? Not before the ordinary tribunals, which would naturally be ſwayed by the authority of ſo powerful an accuſer. Reaſon therefore will ſuggeſt, that this branch of the legiſlature, which repreſents the people, muſt bring its charge before the other branch, which conſiſts of the nobility, who have neither the ſame intereſts, nor the ſame paſſions, as popular aſſemblies. This is a vaſt ſuperiority which the conſtitution of this iſland enjoys over thoſe of the Grecian or Roman republics; where the people were at the ſame time both judges and accuſers. It is proper that the nobility ſhould judge, to enſure juſtice to the accuſed; as it is proper that the people ſhould accuſe, to enſure juſtice to the commonwealth. And therefore, among other extraordinary circumſtances attending the authority of this court, there is one of a very ſingular nature, which was inſiſted on by the houſe of commons in the caſe of the earl of Danby in the reign of Charles II. and is now enacted by ſtatute 12 & 13 W. III. c. 2. that no pardon under the great ſeal ſhall be pleadable to an impeachment by the commons of Great Britain in parliament.

Such is the nature of a Britiſh parliament, and in theory at leaſt we ſhould preſume it were nearly perfect; but ſome of our fellow countrymen, more zealous perhaps than wiſe, ſee prodigious faults in it, ſuch indeed as they think muſt inevitably prove fatal. The conſequence of this perſuaſion has been a loud and inceſſant call for parliamentary reform. That abuſes ought to be reformed, is certain; and that few inſtitutions are ſo perfect as not to need amendment, is a fact equally indiſputable. We ſhall even ſuppoſe that there are many abuſes in our parliament which would require to be amended; but, granting all this, and ſomething more if it were neceſſary, we would recommend in the mean time to the ſerious conſideration of thoſe who call themſelves the *Friends of the People*, whoſe ſincerity in their profeſſions it would be impolite to queſtion, the example of France, and that they would allow it to be a warning to Britain. France wanted reform indeed, and that which was firſt propoſed had the countenance of the cooleſt and the beſt of men; but the conſequences have been dreadful; and if ever a free and ſtable government take place in it, which we ſincerely wiſh may be ſoon, it will have been purchaſed at an immenſe price, by enormities which will diſgrace it whilſt the remembrance of them laſts.

The former *Parliaments of France* were ſovereign courts eſtabliſhed by the king, finally to determine all diſputes between particular perſons, and to pronounce on appeals from ſentences given by inferior judges.—There were ten of theſe parliaments in France, of which that of Paris was the chief, its privileges and juriſdiction being of the greateſt extent. It conſiſted of eight chambers: the grand chamber, where cauſes of audience were pleaded; the chamber of written law; the chamber of counſel; the Tournelle criminelle, for judging criminal affairs; the Tournelle civile, in aid of the grand chamber; and three chambers of inqueſts, where proceſſes were adjudged in writing: beſides theſe, there was alſo the chamber of vacations, and thoſe of requeſts. In 1771 the king thought fit to branch the parliament of Paris into ſix different parliaments, under the denomination of ſuperior courts, each parliament having ſimilar juriſdiction. Under their ſecond race of kings, this parliament, like that of England, was the king's council; it gave audience to ambaſſadors, and conſulted of the affairs of war and government. The king, like ours, at that time preſided in them, without being at all maſter of their reſolutions. But in after times their authority was abridged; as the kings reſerved the deciſion of the grand affairs of the public to their own councils; leaving none but private ones to the parliaments. The parliament of Paris alſo enjoyed the privileges of verifying and regiſtering the king's arrets or edicts, without which thoſe edicts were of little or no value.

Parliament of Sweden, conſiſts of four eſtates, with the king at their head. Theſe eſtates are, 1. The nobility and repreſentatives of the gentry; with whom the colonels, lieutenant colonels, majors, and captains of every regiment, ſit and vote. 2. The clergy; one of which body is elected from every rural deanery of ten pariſhes; who, with the biſhops and ſuperintendents, amount to about 200. 3. The burghers, elected by the magiſtrates and council of every corporation as their repreſentatives, of whom there are four for Stockholm, and two for every other town, amounting in the whole to about 150. 4. The peaſants, choſen by the peaſants out of every diſtrict; who chooſe one of their own rank, and not a gentleman, to repreſent them: theſe amount to about 250.

All theſe generally meet at Stockholm: and after the ſtate affairs have been repreſented to them from the throne, they ſeparate, and ſit in four ſeveral chambers or houſes, in each of which affairs are carried on by majority of votes; and every chamber has a negative in the paſſing any law.

PARMA, an ancient, rich, populous, and handſome town of Italy, capital of the duchy of the ſame name, with a citadel, a biſhop's ſee, and an univerſity. It has a magnificent cathedral, and the largeſt opera houſe in Europe, which has ſeats for 8000 people; but as it required a vaſt number of candles, which occaſioned great expence, they have contrived another which has room for 2000 ſpectators. The dome and the church of St John are painted by the famous Corregio, who was a native of this place. Don Carlos, king of the two Sicilies, carried away the library to Naples, which contained 18,000 volumes, and a very valuable cabinet of curioſities, as alſo the rich collection of medals. The citadel, which is very near the city, is built in the ſame taſte as that at Antwerp. In 1734 there was a bloody battle fought here; and in 1741, by the treaty of Aix-la-Chapelle, the duchies of Parma, Placentia, and Guaſtalla, were given to Don Philip, brother to Don Carlos above-mentioned. It is 30 miles ſouth-eaſt of Cremona, and 60 ſouth-eaſt of Milan. E. Long. 10. 51. N. Lat. 44. 50.

Parma, the duchy of, a province of Italy, bounded on the north by the Po; on the north-eaſt by the Mantuan; on the eaſt by the duchy of Modena; on the ſouth by Tuſcany; and on the weſt by the duchy of Placentia. The air is very wholeſome, on which account the inhabitants live to a great age. The ſoil is very fertile, in corn, wine, oil, and hemp; the paſtures feed a great number of cattle, and the cheeſe is in very high eſteem. Here are conſiderable mines of copper and ſilver, and plenty of truffles, which many are very fond of.

PARMESAN Cheese, a ſort of cheeſe much eſteemed among the Italians; ſo named from the duchy of Parma where it is made, and whence it is conveyed to various parts of Europe.

The excellent paſture grounds of this country are watered by the Po; and the cows from whoſe milk this cheeſe is made yield a great quantity of it. Of this cheeſe there are three ſorts; the *fromaggio di forma*, about two palms in diameter, and ſeven or eight inches thick; and the *fromaggia di ribiole* and *di ribolini*, which are not ſo large. This cheeſe is of a ſaffron colour; and the beſt is kept three or four years. See Cheese.

PARMIGIANO, a celebrated painter, whoſe true name was Franceſco Mazzuoli; but he received the former from the city of Parma, where he was born, in 1504. He was brought up under his two uncles, and was an eminent painter when but 16 years of age. He was famous all over Italy at 19; and at 23 performed ſuch wonders, that when the general of the emperor Charles V. took Rome by ſtorm, ſome of the common ſoldiers having, in ſacking the town, broke into his apartments, found him intent upon his work, and were inſtantly ſo ſtruck with the beauty of his pieces, that inſtead of involving him in the plunder and deſtruction in which they were then employed, they reſolved to protect him from all manner of violence; which they actually performed. His works are diſtinguiſhed by the beauty of the colouring, the invention, and drawing. His figures are ſpirited and graceful, particularly with reſpect to the choice of attitude, and in their dreſſes. He alſo excelled in muſic, in which he much delighted.

In large compoſitions Parmigiano did not always reach a high degree of excellence; but in his holy families, and other ſimilar ſubjects, the gracefulneſs of his heads, and the elegance of his attitudes, are peculiarly delightful. For the celebrity of his name he ſeems to be chiefly indebted to his numerous drawings and etchings; for his life being ſhort, and a great part of it conſumed in the idle ſtudy of alchemy, in purſuit of the philoſopher's ſtone, and in the ſeducing avocations of muſic and gambling, there was but little time left for application to the laborious part of his buſineſs. His paintings in oil are few in number, and held in high eſteem, as are alſo his drawings and etchings; good impreſſions of theſe laſt being very rarely to be found. He was the firſt that practiſed the art of etching in Italy; and probably he did not at firſt know that it had been for ſome years practiſed in Germany. When he ſet out for Rome, he was adviſed to take ſome of his pictures with him, as a means of getting himſelf introduced into the acquaintance of the nobility and artiſts in that celebrated city. One of them is mentioned by his biographers as a maſterpiece. It was his own portrait painted upon a piece of wood of a convex form, in imitation of a convex mirror. The ſurface is ſaid to have been ſo wonderfully executed, that it had the appearance of real glaſs, and the head, as well as every part of the furniture of the chamber in which he was ſuppoſed to ſit, were ſo artfully managed, that the whole formed a very complete piece of deception. At Rome he was employed by Pope Clement VII. who was highly pleaſed with his performances, and rewarded him liberally. A circumciſion which he painted for him was particularly eſteemed as a capital work. In it Parmigiano was ſucceſsful in introducing a variety of lights, without deſtroying the general harmony. When Charles V. came to Bologna to be crowned emperor of the Romans, Parmigiano failed not to be preſent at that ſingular ceremony; and ſo accurately marked the countenance of the emperor, that at his return home, he was enabled from memory to make out a ſurpriſing likeneſs. In the ſame piece he introduced the figure of Fame placing a crown of laurel on the head of the emperor, whilſt a young Hercules preſented him with a globe of the world. Before it was quite finiſhed, the painter and his piece were introduced to Charles by the Pope, but to little purpoſe; for the emperor left Bologna a few days after, without ordering him any recompenſe for his labour. In the church of Madona della Stercato at Parma are ſtill to be ſeen ſeveral of the works of this artiſt; among which one of Sibyls, and two others of Moſes, and of Adam and Eve, are much admired. So alſo is a Dead Chriſt, with the Virgin in ſorrow, in the church of the Dominicans at Cremona. In the Houghton collection of pictures, now in poſſeſſion of the empreſs of Ruſſia, is one of his beſt pictures, repreſenting Chriſt laid in the ſepulchre, for which he is ſaid to have been knighted by the duke of Parma. His principal works are at Parma, where he died poor in 1540.

PARNASSIA, graſs of Parnaſſus, in botany; a genus of the tetragynia order, belonging to the pentandria claſs of plants. The calyx is quinquepartite; there are five petals, and as many nectaria, heart-ſhaped, and ciliated with globular tops; the capſule quadrivalved. There is but one ſpecies, having a ſtalk about a foot high, angular, and often a little twiſted, bearing a ſingle white flower at top. The flowers are very beautifully ſtreaked with yellow; ſo that though it is a common plant, growing naturally in moiſt paſtures, it is frequently admitted into gardens.

PARNASSUS (Strabo, Pindar, Virgil), a mountain of Phocis, near Delphi, and the mounts Cithæron and Helicon, with two tops (Ovid, Lucan); the one called *Cirrha*, ſacred to Apollo; and the other *Niſa*, ſacred to Bacchus, (Juvenal). It was covered with bay trees (Virgil); and originally called *Larnaſſus*, from Deucalion's larnax or ark, thither conveyed by the flood, (Stephanus, Scholiaſt on Apollonius); after the flood, *Parnaſſus*; from Har Nahas, changing the *h* into *p*, the hill of divination or augury (Peucerus); the oracle of Delphi ſtanding at its foot.

Chandler *, who viſited it, thus deſcribes it:—"Parnaſſus was the weſtern boundary of Phocis, and ſtretching northward from about Delphi toward the

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* *Travels in Greece.*

Œtæan mountains, ſeparated the weſtern Locri from thoſe who poſſeſſed the ſea coaſt before Eubœa. It was a place of refuge to the Delphians in times of danger. In the deluge, which happened under Deucalion, the natives were ſaved on it by following the cry of wolves. On the invaſion by Xerxes, ſome tranſported their families over to Achaia, but many concealed them in the mountain, and in Corycium, a grotto of the Nymphs. All Parnaſſus was renowned for ſanctity, but Corycium was the moſt noted among the hallowed caves and places. ‘ On the way to the ſummits of Parnaſſus, ſays Pauſanias, as much as 60 ſtadia beyond Delphi, is a brazen image; and from thence the aſcent to Corycium is eaſier for a man on foot, and for mules and horſes. Of all the caves in which I have been, this appeared to me the beſt worth ſeeing. On the coaſts, and by the ſea ſide, are more than can be numbered; but ſome are very famous both in Greece and in other countries. The Corycian cave exceeds in magnitude thoſe I have mentioned, and for the moſt part may be paſſed through without a light. It is ſufficiently high; and has water, ſome ſpringing up, and yet more from the roof, which petrifies; ſo that the bottom of the whole cave is covered with ſparry icicles. The inhabitants of Parnaſſus eſteem it ſacred to the Corycian Nymphs, and particularly to Pan.—From the cave to reach the ſummits of the mountain is difficult even to a man on foot. The ſummits are above the clouds, and the women called *Thyades* madden on them in the rites of Bacchus and Apollo.’ Their frantic orgies were performed yearly. Wheler and his company aſcended Parnaſſus from Delphi, ſome on horſes, by a track between the Stadium and the clefts of the mountain. Stairs were cut in the rock, with a ſtrait channel, perhaps a water duct.—In a long hour, after many traverſes, they gained the top, and entering a plain turned to the right, towards the ſummits of Caſtalia, which are divided by deep precipices. From this eminence they had a fine proſpect of the gulf of Corinth, and of the coaſt; Mount Cirphis appearing beneath them as a plain, bounded on the eaſt by the bay of Aſproſpitia, and on the weſt by that of Salona. A few ſhepherds had huts there. They returned to the way which they had quitted, and croſſed a hill covered with pines and ſnow. On their left was a lake, and beyond it a peak, exceedingly high, white with ſnow. They travelled to the foot of it through a valley, four or five miles in compaſs; and reſted by a plentiful fountain called *Droſonigo*, the ſtream boiling up a foot in diameter, and nearly as much above the ſurface of the ground. It runs into the lake, which is about a quarter of a mile diſtant to the ſouth-eaſt. They did not diſcover Corycium, or proceed farther on, but keeping the lake on their right, came again to the brink of the mountain, and deſcended by a deep and dangerous track to Racovi, a village four or five miles eaſtward from Delphi. It was the opinion of Wheler, that no mountain in Greece was higher than Parnaſſus; that it was not inferior to Mount Cenis among the Alps; and that, if detached, it would be ſeen at a greater diſtance than even Mount Athos. The ſummits are perpetually increaſing, every new fall of ſnow adding to the perennial heap, while the ſun has power only to thaw the ſuperficies. Caſtalis Pleiſtus and innumerable ſprings are fed, ſome inviſibly, from the lakes and reſervoirs, which, without theſe drains and ſubterraneous vents, would ſwell, eſpecially after heavy rain and the melting of ſnow, ſo as to fill the valleys, and run over the tops of the rocks down upon Delphi, ſpreading wide an inundation, ſimilar, as has been ſurmiſed, to the Deucalionean deluge.”

PARNELL (Dr Thomas), a very ingenious divine and poet in the early part of this century. He was archdeacon of Clogher, and the intimate friend of Mr Pope; who publiſhed his works, with an elegant copy of recommendatory verſes prefixed. He died in 1718, aged 39.

Johnſon † ſays, “ The life of Dr Parnell is a taſk which I ſhould very willingly decline, ſince it has been lately written by Goldſmith, a man of ſuch variety of powers, and ſuch facility of performance, that he always ſeemed to do beſt that which he was doing; a man who had the art of being minute without tediouſneſs, and general without confuſion; whoſe language was copious without exuberance, exact without conſtraint, and eaſy without weakneſs.

“ What ſuch an author has told, who would tell again? I have made an extract from his larger narrative; and ſhall have this gratification from my attempt, that it gives me an opportunity of paying due tribute to the memory of a departed genius.

‘ *Το γαρ γερας εϛι θανοντων.*’

“ The general character of Parnell is not great extent of comprehenſion, or fertility of mind. Of the little that appears ſtill leſs is his own. His praiſe muſt be derived from the eaſy ſweetneſs of his diction: in his verſes there is more happineſs than pains; he is ſprightly without effort, and always delights though he never raviſhes; every thing is proper, yet every thing ſeems caſual. If there is ſome appearance of elaboration in the Hermit, the narrative, as it is leſs airy, is leſs pleaſing. Of his other compoſitions, it is impoſſible to ſay whether they are the productions of Nature ſo excellent as not to want the help of Art, or of Art ſo refined as to reſemble Nature.”

PARODY, a popular maxim, adage, or proverb.

Parody, is alſo a poetical pleaſantry, conſiſting in applying the verſes written on one ſubject, by way of ridicule, to another; or in turning a ſerious work into a burleſque, by affecting to obſerve as near as poſſible the ſame rhimes, words, and cadences.

The parody was firſt ſet on foot by the Greeks; from whom we borrow the name. It comes near to what ſome of our late writers call *traverſty*. Others have more accurately diſtinguiſhed between a parody and burleſque; and they obſerve, that the change of a ſingle word may parody a verſe; or of a ſingle letter a word. Thus, in the laſt caſe, Cato expoſed the inconſtant diſpoſition of Marcus Fulvius Nobilior, by changing Nobilior into Mobilior. Another kind of parody conſiſts in the mere application of ſome known verſe, or part of a verſe of a writer, without making any change in it, with a view to expoſe it. A fourth inſtance is that of writing verſes in the taſte and ſtile of authors little approved. The rules of parody regard the choice of a ſubject, and the manner of treating it. The ſubject ſhould be a known and celebrated work: as to the manner, it ſhould be by an exact imitation, and an intermixture of good natural pleaſantry.

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† *Lives of the Poets.*

PAROLE, in a military ſenſe, the promiſe made by a priſoner of war, when he has leave to go anywhere, of returning at a time appointed, if not exchanged.

Parole, means alſo a word given out every day in orders by the commanding officer, both in camp and garriſon, in order to know friends from enemies.

PARONOMASIA, in rhetoric, a pun; or a figure whereby words nearly alike in ſound, but of very different meanings, are affectedly or deſignedly uſed. See Oratory, N° 76.

PARONYCHIA, the Whitlow, in ſurgery, is an abſceſs at the end of the fingers. According as it is ſituated more or leſs deep, it is differently denominated, and divided into ſpecies.

It begins with a ſlow heavy pain, attended with a ſlight pulſation, without ſwelling, redneſs, or heat: but ſoon the pain, heat, and throbbing, are intolerable; the part grows large and red, the adjoining fingers and the whole hand ſwell up; in ſome caſes, a kind of red and inflated ſtreak may be obſerved, which beginning at the affected part, is continued almoſt to the elbow; nor is it unuſual for the patient to complain of a very ſharp pain under the ſhoulder, and ſometimes the whole arm is exceſſively inflamed and ſwelled; the patient cannot ſleep, the fever, &c. increaſing; and ſometimes delirium or convulſions follow.

I. When it is ſeated in the ſkin or fat, in the back or the fore part of the finger, or under or near the nail, the pain is ſevere, but ends well. 2. When the perioſteum is inflamed or corroded, the pain is tormenting. 3. When the nervous coats of the flexor tendons of the fingers or nerves near them are ſeized, the worſt ſymptoms attend. If the firſt kind ſuppurates, it muſt be opened, and treated as abſceſſes in general; but the beſt method of treating the other two ſpecies is, on the firſt, or at furtheſt the ſecond day, to cut the part where the pain is ſeated quite to the bone: if this operation is longer deferred, a ſuppuration will come on; in which caſe ſuppuration ſhould be ſpeedily promoted, and as early a diſcharge given to the matter as poſſible. As the pain is ſo conſiderable as to occaſion a fever, and ſometimes convulſions, the tinct. theb. may be added to the ſuppurating applications, and alſo given in a draught at bed time. The ſecond ſpecies proves very troubleſome, and ſometimes ends in a caries of the ſubjacent bone. The third ſpecies is very tedious in the cure, and uſually the phalanx on which it is ſeated is deſtroyed.

PAROS (anc. geog.), an iſland of the Ægean ſea, one of the Cyclades, with a ſtrong cognominal town, 38 miles diſtant from Delos (Pliny, Nepos). Anciently called *Pactye* and *Minoa* (Pliny) alſo *Demetrias*, *Zacynthus*, *Hyria*, *Hylceſſa*, and *Cabarnis* (Nicanor). The country of Archilochus the Iambic poet (Strabo). An iſland famous for its white marble (Virgil, Horace, Ovid), called *lychnites*, becauſe dug with lamps (Pliny), The name of Cabarnis is borrowed, according to Stephanus, from one Cabarnus, who firſt informed Ceres of the rape of her daughter Proſerpine; or, according to Heſychius, from the Cabarni, the prieſts of Ceres being ſo called by the inhabitants of this iſland. The name of Minoa is borrowed from Minos king of Crete, who ſubdued this, as he did moſt of the other iſlands of the Ægean ſea. It was called Paros, which name it retains to this day, from Paros the ſon of Parrhaſius, or, as Stephanus will have it, of Jaſon the Argonaut. Paros, according to Pliny's computation, is diſtant from Naxos ſeven miles and a half, and 28 from Delos. Some of the modern travellers will have it to be 80, others only 50 miles in compaſs. Pliny ſays it is half as large as Naxos, that is, between 36 and 37 miles in compaſs. It was a rich and powerful iſland, being termed the moſt wealthy and happy of the Cyclades, and by Cornelius Nepos an iſland elated with its riches. The city of Paros, the metropolis, is ſtyled by Stephanus a potent city, and one of the largeſt in the Archipelago: the preſent city of Paros, now Parichia, is ſuppoſed to have been built upon its ruins, the country abounding with valuable monuments of antiquity. The very walls of the preſent city are built with columns, architraves, pedeſtals, mingled with pieces of ancient marble of a ſurpriſing magnitude, which were once employed in more noble edifices. Paros was indeed formerly famous for its marble, which was of an extraordinary whiteneſs, and in ſuch requeſt among the ancients that the beſt ſtatuaries uſed no other (A). The iſland is provided with ſeveral capacious and ſafe harbours, and was anciently much reſorted to by traders. It was, according to Thucydides, originally peopled by the Phœnicians, who were the firſt maſters of the ſea. Afterwards the Carians ſettled here, as we are told by Thucydides and Diodorus. But theſe two authors differ as to the time when the Carians came firſt into the iſland; for Thucydides tells us, that the Carians were driven out by the Cretans under the conduct of Minos; and Diodorus writes, that the Carians did not ſettle here till after the Trojan war, when they found the Cretans in poſſeſſion of the iſland. Stephanus thinks that the Cretans, mixed with ſome Arcadians, were the only people that ever poſſeſſed this iſland. Minos himſelf if we believe Pliny, reſided ſome time in the iſland of Paros, and received here the melancholy news of the death of his ſon Androgeus, who was killed in Attica after

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(A) Sutherland ſays, "that while its marble quarries continued to be worked, Paros was one of the moſt flouriſhing of the Cyclades; but on the decline of the eaſtern empire they were entirely neglected, and are now converted into caves, in which the ſhepherds ſhelter their flocks. We have been in ſeveral of theſe ſubterraneous folds, which put me much in mind of Homer's deſcription of Polyphemus. The common walls are almoſt entirely compoſed of marble; and in examining a very ſmall part of one, we found ſeveral pieces of cornice and baſſo relievo. Several fine blocks of marble; (fragments of columns) are lying cloſe to the water's edge; and ſeem to have been brought there by travellers, who for want of a proper purchaſe to get them on board, have not been able to carry them further."

after he had diſtinguiſhed himſelf at the public games. We find the inhabitants of this iſland choſen from among all the Greeks by the Mileſians to compoſe the differences which had for two generations rent that unhappy ſtate into parties and factions. They acquitted themſelves with great prudence, and reformed the government. They aſſiſted Darius in his expedition againſt Greece with a conſiderable ſquadron; but after the victory obtained by Miltiades at Marathon, they were reduced to great ſtraits by that general. However, after blocking up the city for 26 days, he was obliged to quit the enterpriſe, and return to Athens with diſgrace. Upon his departure, the Parians were informed that Timo, a prieſteſs of the national gods, and then his priſoner, had adviſed him to perform ſome ſecret ceremony in the temple of Ceres, near the city; aſſuring him that he would thereby gain the place. Upon this information they ſent deputies to conſult the oracle of Delphi, whether they ſhould puniſh her with death, for endeavouring to betray the city to the enemy, and diſcovering the ſacred myſteries to Miltiades. The Pythian anſwered, that Timo was not the adviſor; but that the gods, having reſolved to deſtroy Miltiades, had only made her the inſtrument of his death. After the battle of Salamis, Themiſtocles ſubjected Paros and moſt of the other neighbouring iſlands to Athens, exacting large ſums from them by way of puniſhment for having favoured the Perſians. It appears from the famous monument of Adulas, which Coſmos of Egypt has deſcribed with great exactneſs, that Paros and the other Cyclades were once ſubject to the Ptolemies of Egypt. However, Paros fell again under the power of the Athenians, who continued maſters of it till they were driven out by Mithridates the Great. But that prince being obliged to yield to Sylla, to Lucullus, and to Pompey, this and the other iſlands of the Archipelago ſubmitted to the Romans, who reduced them to a province with Lydia, Phrygia, and Caria.

Mr Sutherland, who lately viſited Paros, ſays, that "the water in it is excellent; and as that which we got at Meſſina has been complained of, as being too hard to make proper peaſe ſoup for the people, all the caſks are ordered to be emptied and refilled. The Ruſſians made this place their grand arſenal; their powder magazines, and ſeveral other buildings, are ſtill ſtanding; and the iſland is conſiderably indebted to them for improving the convenience for water, and for the trade which the caſh they expended introduced among the inhabitants."

PAROTIDES, in anatomy. See there, N° 128.

PAROXYSM, in medicine, the ſevere fit of a diſeaſe, under which it grows higher or exaſperated; as of the gout, &c.

PARR (Catharine), was the eldeſt daughter of Sir Thomas Parr of Kendall. She was firſt married to John Nevil, Lord Latymer; after whoſe death ſhe ſo captivated her amorous ſovereign, that he raiſed her to the throne. The royal nuptials were ſolemnized at Hampton Court on the 12th of July 1543. Being religiouſly diſpoſed, ſhe was, in the early part of her life, a zealous obſerver of the Romiſh rites and ceremonies; but in the dawning of the Reformation, ſhe became as zealous a promoter of the Lutheran doctrine; yet with ſuch prudence and circumſpection as her perilous ſituation required. Nevertheleſs, we are told, that ſhe was in great danger of falling a ſacrifice to the Popiſh faction, the chief of whom was Biſhop Gardiner: he drew up articles againſt her, and prevailed on the king to ſign a warrant to remove her to the Tower. This warrant was, however, accidentally dropped, and immediately conveyed to her majeſty. What her apprehenſions muſt have been on this occaſion may be eaſily imagined. She knew the monarch, and ſhe could not help recollecting the fate of his former queens. A ſudden illneſs was the natural conſequence. The news of her indiſpoſition brought the king to her apartment. He was laviſh in expreſſions of affection, and ſent her a phyſician. His majeſty being ſoon after alſo ſomewhat indiſpoſed, ſhe prudently returned the viſit; with which the king ſeemed pleaſed, and began to talk with her on religious ſubjects, propoſing certain queſtions, concerning which he wanted her opinion. She anſwered, that ſuch profound ſpeculations were not ſuited to her ſex; that it belonged to the huſband to chooſe principles for his wife; the wife's duty was, in all caſes, to adopt implicitly the ſentiments of her huſband: and as to herſelf, it was doubly her duty, being bleſſed with a huſband who was qualified, by his judgment and learning, not only to chooſe principles for his own family, but for the moſt wiſe and knowing of every nation. "Not ſo, by St Mary," replied the king; "you are now become a doctor, Kate, and better fitted to give than receive inſtruction." She meekly replied, that ſhe was ſenſible how little ſhe was entitled to theſe praiſes; that though ſhe uſually declined not any converſation, however ſublime, when propoſed by his majeſty, ſhe well knew that her conceptions could ſerve to no other purpoſe than to give him a little momentary amuſement; that ſhe found the converſation a little apt to languiſh when not revived by ſome oppoſition, and ſhe had ventured ſometimes to feign a contrariety of ſentiments, in order to give him the pleaſure of refuting her; and that ſhe alſo propoſed, by this innocent artifice, to engage him into topics whence ſhe had obſerved, by frequent experience, that ſhe reaped profit and inſtruction. "And is it ſo, ſweetheart?" replied the king; "then we are perfect friends again." He embraced her with great affection, and ſent her away with aſſurances of his protection and kindneſs.

The time being now come when ſhe was to be ſent to the Tower, the king, walking in the garden, ſent for the queen, and met her with great good humour; when lo the chancellor, with forty of the guards, approached. He fell upon his knees, and ſpoke ſoftly with the king, who called him knave, arrant knave, beaſt, fool, and commanded him inſtantly to depart. Henry then returned to the queen, who ventured to intercede for the chancellor: "Ah, poor ſoul," ſaid the king, "thou little knoweſt how evil he deſerveth this grace at thy hands. Of my word, ſweetheart, he hath been toward thee an arrant knave; and ſo let him go." The king died in January 1547, juſt three years and a half after his marriage with this ſecond Catharine; who in a ſhort time was again eſpouſed to Sir Thomas Seymour lord-admiral of England: for in

September 1548 ſhe died in childbed. The hiſtorians of this period generally inſinuate that ſhe was poiſoned by her huſband, to make way for his marriage with the Lady Elizabeth.

That Catharine Parr was beautiful is beyond a doubt: that ſhe was pious and learned is evident from her writings: and that her prudence and ſagacity were not inferior to her other accompliſhments, may be concluded from her holding up the paſſion of a capricious tyrant as a ſhield againſt her enemies; and that at the latter end of his days, when his paſſions were enfeebled by age, and his peeviſh auſterity increaſed by diſeaſe. She wrote, 1. Queen Catharine Parr's lamentation of a ſinner, bewailing the ignorance of her blind life; Lond. 8vo, 1548, 1563. 2. Prayers or meditations, wherein the mynd is ſtirred patiently to ſuffre all afflictions here, to ſet at nought the vaine proſperitee of this worlde, and always to long for the everlaſtynge felicitee. Collected out of holy workes, by the moſt virtuous and gracious princeſſe Katherine, Queen of Englande, France, and Irelande. Printed by John Wayland, 1545, 4to,—1561, 12mo. 3. Other Meditations, Prayers, Letters, &c. unpubliſhed.

Parr (Thomas), or *Old Parr*, a remarkable Engliſhman, who lived in the reigns of ten kings and queens; married a ſecond wife when he was 120, and had a child by her. He was the ſon of John Parr, a huſbandman of Winnington, in the pariſh of Alderbury, in the county of Salop, where he was born in the year 1483. Though he lived to the vaſt age of upwards of 152 years, yet the tenor of his life admitted but of little variety; nor can the detail of it be conſidered of importance, further than what will ariſe from the gratification of that curioſity which naturally inquires after the mode of living which could lengthen life to ſuch extreme old age. Following the profeſſion of his father, he laboured hard, and lived on coarſe fare. Taylor the water poet ſays of him:

Good wholeſome labour was his exerciſe,
Down with the lamb, and with the lark would riſe;
In mire and toiling ſweat he ſpent the day,
And to his team he whiſtled time away:
The cock his night-clock, and till day was done,
His watch and chief ſun-dial was the ſun.
He was of old Pythagoras' opinion,
That green cheeſe was moſt wholeſome with an onion;
Coarſe meſlin bread, and for his daily ſwig,
Milk, butter-milk, and water, whey and whig:
Sometimes metheglin, and by fortune happy,
He ſometimes ſipp'd a cup of ale moſt nappy,
Cyder or perry, when he did repair
T' a Whitſun ale, wake, wedding, or a fair,
Or when in Chriſtmas time he was a gueſt
At his good landlord's houſe amongſt the reſt:
Elſe he had little leiſure time to waſte,
Or at the alehouſe huff-cap ale to taſte.
Nor did he ever hunt a tavern fox;
Ne'er knew a coach, tobacco, or the——.
His phyſic was good butter, which the ſoil
Of Salop yields, more ſweet than Candy oil;
And garlic he eſteem'd above the rate
Of Venice treacle, or beſt mithridate.
He entertain'd no gout, no ache he felt,
The air was good and temperate where he dwelt;
While maviſſes and ſweet-tongu'd nightingales
Did chant him roundelays and madrigals.
Thus living within bounds of Nature's laws,
Of his long laſting life may be ſome cauſe.

And the ſame writer deſcribes him in the following two lines:

From head to heel, his body had all over
A quick ſet, thick ſet, natural hairy cover.

The manner of his being conducted to London is alſo noticed in the following terms: "The Right Hon. Thomas Earl of Arundel and Surrey, earl marſhal of England, on being lately in Shropſhire to viſit ſome lands and manors which his lordſhip holds in that county, or for ſome other occaſions of importance which cauſed his lordſhip to be there, the report of this aged man was ſignified to his honour, who hearing of ſo remarkable a piece of antiquity, his lordſhip was pleaſed to ſee him; and in his innate, noble, and Chriſtian piety, he took him into his charitable tuition and protection, commanding that a litter and two horſes (for the more eaſy carriage of a man ſo feeble and worn with age) to be provided for him; alſo, that a daughter of his, named Lucy, ſhould likewiſe attend him, and have a horſe for her own riding with him: and to cheer up the old man, and make him merry, there was an antique-faced fellow, with a high and mighty no-beard, that had alſo a horſe for his carriage. Theſe were all to be brought out of the country to London by eaſy journeys, the charge being allowed by his lordſhip; likewiſe one of his lordſhip's own ſervants, named Bryan Kelly, to ride on horſeback with them, and to attend and defray all manner of reckonings and expences. All which was done accordingly as follows:—

"Winnington is a pariſh of Alderbury, near a place called the Welch Pool, eight miles from Shrewſbury; from whence he was carried to Wem, a town of the earl's aforeſaid; and the next day to Shiffnall, a manor-houſe of his lordſhip's, where they likewiſe ſtayed one night: from Shiffnall they came to Wolverhampton, and the next day to Birmingham, and from thence to Coventry. Although Maſter Kelly had much to do to keep the people off, that preſſed upon him in all places where he came, yet at Coventry he was moſt oppreſſed, for they came in ſuch multitudes to ſee the old man, that thoſe that defended him were almoſt quite tired and ſpent, and the aged man in danger of being ſtifled; and, in a word, the rabble were ſo unruly, that Bryan was in doubt he ſhould bring his charge no farther; ſo greedy are the vulgar to hearken to or gaze after novelties. The trouble being over, the next day they paſſed to Daintree, to Stony Stratford, to Radburne, and ſo to London; where he was well entertained and accommodated with all things, having all the aforeſaid attendance at the ſole charge and coſt of his lordſhip." When brought before the king, his majeſty, with more acuteneſs than good manners, ſaid to him, "You have lived longer than other men, what have you done more than other men?" He anſwered, "I did penance when I was a hundred years old." This journey, however, proved fatal to him; owing to the alteration in his diet, to the change of the air, and his general mode of life, he lived but a very ſhort time, dying the 5th of November

1635 (A); and was buried in Weſtminiſter Abbey. After his death, his body was opened; and an account was drawn up by the celebrated Dr Harvey, part of which we ſhall lay before our readers.

"Thomas Parr was a poor country man of Shropſhire, whence he was brought up to London by the Right Hon. Thomas earl of Arundel and Surry; and died after he had outlived nine princes, in the tenth year of the tenth of them, at the age of 152 years and nine months.

"He had a large breaſt, lungs not fungous, but ſticking to his ribs, and diſtended with blood; a lividneſs in his face, as he had a difficulty of breathing a little before his death, and a long laſting warmth in his armpits and breaſt after it; which ſign, together with others, were ſo evident in his body, as they uſe to be on thoſe that die by ſuffocation. His heart was great, thick, fibrous, and fat. The blood in the heart blackiſh and diluted. The cartilages of the ſternum not more bony than in others, but flexile and ſoft. His viſcera were ſound and ſtrong, eſpecially the ſtomach; and it was obſerved of him, that he uſed to eat often by night and day, though contented with old cheeſe, milk, coarſe bread, ſmall beer, and whey; and, which is more remarkable, that he ate at midnight a little before he died. His kidneys were covered with fat, and pretty ſound; only on the interior ſurface of them were found ſome aqueous or ſerous abſceſſes, whereof one was near the bigneſs of a hen egg, with a yellowiſh water in it, having made a roundiſh cavity, impreſſed on that kidney; whence ſome thought it came that a little before his death a ſuppreſſion of urine had befallen him; though others were of opinion, that his urine was ſuppreſſed upon the regurgitation of all the ſeroſity into his lungs. Not the leaſt appearance there was of any ſtony matter either in the kidneys or bladder. His bowels were alſo ſound, a little whitiſh without. His ſpleen very little, hardly equalling the bigneſs of one kidney. In ſhort, all his inward parts appeared ſo healthy, that if he had not changed his diet and air, he might perhaps have lived a good while longer. The cauſe of his death was imputed chiefly to the change of food and air; foraſmuch as coming out of a clear, thin, and free air, he came into the thick air of London; and after a conſtant plain and homely country diet, he was taken into a ſplendid family, where he fed high and drank plentifully of the beſt wines, whereupon the natural functions of the parts of his body were overcharged, his lungs obſtructed, and the habit of the whole body quite diſordered; upon which there could not but enſue a diſſolution. His brain was ſound, entire, and firm; and though he had not the uſe of his eyes, nor much of his memory, ſeveral years before he died, yet he had his hearing and apprehenſion very well; and was able, even to the 130th year of his age, to do any huſbandman's work, even thraſhing of corn."

The following ſummary of his life is copied from Oldy's MS. notes on Fuller's Worthies: Old Parr was born 1483; lived at home until 1500, æt. 17, when he went out to ſervice. 1518, æt. 35, returned home from his maſter. 1522, æt. 39, ſpent four years on the remainder of his father's leaſe. 1543, æt. 60, ended the firſt leaſe he renewed of Mr Lewis Porter. 1563, æt. 80, married Jane, daughter of John Taylor, a maiden; by whom he had a ſon and a daughter, who both died very young. 1564, æt. 81, ended the ſecond leaſe which he renewed of Mr John Porter. 1585, æt. 102, ended the third leaſe he had renewed of Mr Hugh Porter. 1588, æt. 105, did penance in Alderbury church, for lying with Katharine Milton, and getting her with child. 1595, æt. 112, he buried his wife Jane, after they had lived 32 years together. 1605, æt. 122, having lived 10 years a widower, he married Jane, widow of Anthony Adda, daughter of John Lloyd of Gilſells, in Montgomeryſhire, who ſurvived him. 1635, æt. 152, he died; after they had lived together 30 years, and after 50 years poſſeſſion of his laſt leaſe. See LONGEVITY.

PARRA, in ornithology, a genus of birds belonging to the order of grallæ; the characters of which are: The bill is tapering and a little obtuſe; the noſtrils are oval, and ſituated in the middle of the bill; the forehead is covered with fleſhy caruncles, which are lobated; the wings are ſmall, and ſpinous. There are five ſpecies; of which the moſt remarkable is the chavaria, which is about the ſize of the domeſtic cook. The Indians in the neighbourhood of Carthagena, who breed large flocks of poultry that ſtray in the woods, train up the chavaria to defend them againſt the numerous birds of prey, no one of which will dare to encounter it. It is never known to deſert the flock, and it returns every evening to rooſt.

The parra Dominica is about the ſize of the lapwing. The bill is yellow, as are alſo the head and upper parts; the under are of a yellowiſh white bordering on roſe colour. The legs are alſo yellow. This ſpecies inhabits ſeveral of the warmer parts of America and St Domingo. The parra ſenegalla is about the ſame ſize with the former. Its bill is alſo yellow tipped with black: the forehead is covered with a yellow ſkin; the chin and throat are black; the head and upper parts of the body and leſſer wing coverts are gray brown. The lower part of the belly, and the upper and under tail coverts are dirty white. At the bend of the wing is a black ſpur. It inhabits Senegal, and thence derives its name. The negroes call them *Uett Uett*, the French the *ſquallers*, becauſe, as we are told, as ſoon as they ſee a man they ſcream and fly off. They always fly in pairs. The parra jacana, or ſpur winged water hen, is about the ſize of the water rail. The bill is in length about an inch and a quarter, of an orange colour; and on the forehead is a membranous flap half an inch long and nearly as broad. On each ſide of the head alſo is another of the ſame, about a quarter of an inch broad, and both together they ſurround the baſe of the bill. The head, throat, neck, breaſt, and under parts,

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(A) The author of a book entitled *Long Livers*, 8vo, 1722, which Oldy's in his MS. notes on Fuller aſcribes to one Robert Samber, againſt all evidence ſays, p. 89, that Parr died ſixteen years after he had been preſented to the king, 24th of November 1651.

parts, are black; and ſometimes the belly is mixed with white, &c. The birds of this ſpecies inhabit Braſil, Guiana, and Surinam; but are equally common at St Domingo, where they frequent the marſhy places, ſides of ponds, and ſtreams, and wade quite up to the thighs in the water. They are alſo generally ſeen in pairs, and when ſeparated call each other continually till they join again. They are very ſhy, and moſt common in the rainy ſeaſons in May and November. They are at all times very noiſy; their cry ſharp and ſhrill, and may be heard a great way off. This, as well as the other ſpecies, is called by the French *chirurgien*. The fleſh is accounted pretty good. The parra variabilis, or ſpur-winged water hen, is about nine inches long. The bill is about 14 inches in length, and in colour is orange yellow. On the forehead is a flap of red ſkin; the crown of the head is brown, marked with ſpots of a darker colour; the hind part of the neck is much the ſame, but of a deeper dye. The ſides of the head, throat, fore part of the neck, breaſt, belly, thighs, and under tail coverts are white, with a very few red ſpots on the ſides of the belly and baſe of the thighs. On the fore part of the wing is a yellow ſpur, &c. The legs are furniſhed with long toes, as in all the others, the colour of which is bluiſh aſh. Mr Latham ſays that one which came under his inſpection from Cayenne was rather ſmaller. It had the upper parts much paler; over the eye was a ſtreak of white paſſing no further, and unaccompanied by a black one. The hind part of the neck was duſky black. It had only the rudiment of a ſpur; and the red caruncle on the forehead was leſs, and laid back on the forehead. From theſe differences this learned ornithologiſt conceives it to have differed either in ſex or age from the other. This ſpecies inhabits Braſil, and is ſaid to be pretty common about Carthagena and in South America. The parra chavaria is, as we have already obſerved, about the ſize of a dunghill cock, and ſtands a foot and a half from the ground. The bill is of a dirty white colour; the upper mandible ſimilar to that in a dunghill cock; the noſtrils are oblong, pervious: on both ſides, at the baſe of the bill, is a red membrane, which extends to the temples. The irides are brown. On the hind head are about 12 blackiſh feathers, three inches in length, forming a creſt and hanging downwards. The reſt of the neck is covered with a thick black down. The body is brown, and the wings and tail inclined to black. On the bend of the wing are two or three ſpurs half an inch long. The belly is a light black. The thighs are half bare of feathers. The legs are very long, and of a yellow red colour. The toes are ſo long as to entangle one another in walking.

Latham's Synopſis.

"This ſpecies inhabits the lakes, &c. near the river Cinu, about 30 leagues from Carthagena, in South America, and is ſaid to feed on vegetables. Its gait is ſolemn and ſlow; but it flies eaſily and ſwiftly. It cannot run, unleſs aſſiſted by the wings at the ſame time. When any part of the ſkin is touched by the hand a crackling is felt, though it is very downy beneath the feathers; and indeed this down adheres ſo cloſely as to enable the bird at times to ſwim. The voice is clear and loud, but far from agreeable. The natives, who keep poultry in great numbers have one of theſe tame, which goes along with the flock about the neighbourhood to feed during the day, when this faithful ſhepherd defends them againſt birds of prey, being able, by means of the ſpurs on the wings, to drive off birds as big as the carrion vulture, and even that bird itſelf. It is ſo far of the greateſt uſe, as it never deſerts the charge committed to its care, bringing them all home ſafe at night. It is ſo tame as to ſuffer itſelf to be handled by a grown perſon; but will not permit children to attempt the ſame.—For the above account we are indebted to Linnæus, who ſeems to be the only one who has given any account of this wonderful bird." See *Latham's Synopſis*.

PARRELS, in a ſhip, are frames made of trucks, ribs, and ropes, which having both their ends faſtened to the yards, are ſo contrived as to go round about the maſts, that the yards by their means may go up and down upon the maſt. Theſe alſo, with the breaſt ropes, faſten the yards to the maſts.

PARRET, or PEDRED river, has its riſe in the ſouthern part of Somerſetſhire in England. Near Langport it is joined by the Ordred, augmented by the Evel; and about four miles from this junction, it is joned by the Tone or Thone a pretty lage river, riſing among the hills in the weſtern parts of this county. About two miles below the junction of the Tone, the Parret receives another conſiderable ſtream; and thus augmented, it paſſes by the town of Bridgewater, and falls into the Briſtol channel in Bridgewater bay.

PARRHASIUS, a famous ancient painter of Epheſus, or, as ſome ſay, of Athens: he flouriſhed about the time of Socrates, according to Xenophon, who hath introduced him into a dialogue diſcourſing with that philoſopher. He was one of the beſt painters in his time. Pliny ſays, that it was he who firſt gave ſymmetry and juſt proportions in that art; that he was likewiſe the firſt who knew how to expreſs the truth and life of characters, and the different airs of the face; that he diſcovered a beautiful diſpoſition of the hair and heightened the grace of the viſage. It is allowed even by the maſters in the art, that he far outſhone them in the glory of ſucceeding in the outlines, in which conſiſts the grand ſecret of painting. But it is alſo remarked by Pliny, that Parrhaſius became inſupportable with pride; and was ſo very vain as to give himſelf the moſt flattering epithets; ſuch as, the tendereſt, the ſofteſt, the grandeſt, the moſt delicate, and the perfecter of his art. He boaſted that he was ſprung from Apollo, and that he was born to paint the gods; that he had actually drawn Hercules touch by touch: that hero having often appeared to him in dreams. When the plurality of voices was againſt him at Samos in favour of Timanthes, in the opinion of a picture of Ajax provoked againſt the Greeks, for adjudging to Ulyſſes the arms of Achilles, he anſwered a perſon who condoled him on his check, "For my part I don't trouble myſelf at the ſentence; but I am ſorry that the ſon of Telamon, hath received a greater outrage than that which was formerly put upon him ſo unjuſtly." Ælian relates this ſtory, and tell us that Parrhaſius affected to wear a crown of gold upon his head, and to carry in his hand a batoon, ſtudded with nails of the ſame metal. He worked at his art with pleaſantry, often indeed ſinging. He was very licentious and looſe in his pictures; and he is ſaid, by way of amuſement, to have repreſented the moſt infamous objects. His Atalantis, with her ſpouſe Meleager, was of this kind. This piece was afterwards deviſed as a legacy to the emperor Tiberius, upon condition that, if he was diſpleaſed with the ſubject, he ſhould receive a million ſeſterces inſtead of it. The emperor, covetous as he was, not only preferred the picture to that ſum, but even placed it in his moſt favourite apartment. It is alſo ſaid, that, though Parrhaſius was excelled by Timanthes, yet he excelled Zeuxis. Among his pictures is a celebrated one of Theſeus; and another repreſenting Meleager, Hercules, and Perſeus in a group together; as alſo Æneas, with Caſtor and Pollux, in a third.

Parrhasius (Janus), a famous grammarian in Italy, who was born at Coſenza in the kingdom of Naples, 1470. He was intended for the law, the profeſſion of his anceſtors; but he refuſed it, and cultivated claſſical learning. His real name was Johannes Paulus Pariſius; but according to the humour of the grammarians of the age, he took inſtead of it Parrhaſius. He taught at Milan with much reputation, being admired for a graceful delivery, in which he chiefly excelled other profeſſors.—It was this charm in his voice, which brought a vaſt concourſe of people to his lectures; and among others he had the pleaſure to ſee General Trimoles, who was then threeſcore years old. He went to Rome when Alexander VI. was pope; and was like to be involved in the misfortunes of Bernardini Cajetan and Silius Savello, with whom he had ſome correſpondence; but he eſcaped the danger, by the information of Thomas Phœdrus, profeſſor of rhetoric, and canon of St John Lateran, whoſe advice he followed in retiring from Rome. Soon after, he was appointed public profeſſor of rhetoric at Milan; but the liberty he took to cenſure the teachers there as arrant blockheads, provoked them in return to aſperſe his morals. They ſaid he had a criminal converſe with his ſcholars: which being a crime extremely abhorred by the Milaneſe, our profeſſor was obliged to leave Milan. He went to Vicenza, where he obtained a larger ſalary; and he held this profeſſorſhip till the ſtates of the Venetians were laid waſte by the troops of the League: upon which he went to his native country, having made his eſcape through the army of the enemies. He was at Coſenza, when his old friend Phœdrus perſuaded Julius to ſend for him to Rome; and, though that deſign proved abortive by the death of the pope, yet, by the recommendation of John Laſcaris, he was called thither under his ſucceſſor Leo X. Leo was before favourably inclined to him; and on his arrival at Rome, appointed him profeſſor of polite literature. He had been now ſome time married to a daughter of Demetrius Chalcondylas; and he took with him to Rome Baſil Chalcondylas, his wife's brother, and brother of Demetrius Chalcondylas, profeſſor of the Greek tongue at Milan. He did not long enjoy this employ conferred upon him by the pope; for, worn out by his ſtudies and labours, he became ſo afflicted with the gout, that for ſome years he had no part of his body free, except his tongue: having almoſt loſt the uſe of both his legs and both his arms. He laboured beſides under ſo great a degree of poverty, as put him out of all hopes of being ever in a better ſituation; ſo that he left Rome, and returned into Calabria, his native country, where he was tormented a long while with a fever, and at laſt died in the greateſt miſery. He left his library to his friend Seripandus, brother to Cardinal Jerome Seripandus, who built him a tomb in the convent of the Auſtin friars at Naples. There are ſeveral books aſcribed to him; and in the dedication of one of them, his character is drawn to great advantage by Henry Stephens.

PARRHESIA. See Oratory, N° 88.

PARRICIDE, the murder of one's parents or children. By the Roman law, it was puniſhed in a much ſeverer manner than any other kind of homicide. After being ſcourged, the delinquents were ſewed up in a leathern ſack, with a live dog, a cock, a viper, and an ape, and ſo caſt into the ſea. Solon, it is true, in his laws, made none againſt parricide; apprehending it impoſſible that one ſhould be guilty of ſo unnatural a barbarity. And the Perſians, according to Herodotus, entertained the ſame notion, when they adjudged all perſons who killed their reputed parents to be baſtards. And upon ſome ſuch reaſon as this muſt we account for the omiſſion of an exemplary puniſhment for this crime in our Engliſh laws; which treat it no otherwiſe than as ſimple murder, unleſs the child was alſo the ſervant of the parent.

For though the breach of natural relation is unobſerved, yet the breach of civil or eccleſiaſtic connexions, when coupled with murder, denominates it a new offence; no leſs than a ſpecies of treaſon, called *parva proditio*, or *petit treaſon*; which, however, is nothing elſe but an aggravated degree of murder: although, on account of the violation of private allegiance, it is ſtigmatized as an inferior ſpecies of treaſon. And thus, in the ancient Gothic conſtitution, we find the breach both of natural and civil relations ranked in the ſame claſs with crimes againſt the ſtate and ſovereign.

PARROT, in ornithology. See Psittacus.

PARSHORE, a town of England in Worceſterſhire, ſeven miles from Worceſter, and 102 from London, is a neat old town on the north ſide of the Avon, near its junction with the river Bow, being a conſiderable thoroughfare in the lower road from Worceſter to London. A religious houſe was founded here in 604, a ſmall part of which now remains, and is uſed as the pariſh church of Holy Croſs, the whole of which contained above 10 acres. The abbey church was 250 feet long, and 120 broad. The pariſh of Parſhore is of great extent, and hath within its limits many manors and chapelries. At preſent it has two pariſhes, Holy Croſs and St Andrew. In Holy Croſs church are ſeveral very antique monuments. Its chief manufacture is ſtockings. It contains about 300 houſes, and has markets on Tueſday and Saturday; fairs Eaſter-Tueſday, June 26th, and Tueſday before November 1ſt.

PARSLEY, in botany. See Apium.

PARSNEP, in botany. See Pastinaca.

PARSON *and* Vicar. A parſon, *perſona eccleſiæ*, is one that hath full poſſeſſion of all the rights of a parochial church. He is called parſon, *perſona*, becauſe by his perſon the church, which is an inviſible body, is repreſented; and he is in himſelf a body corporate, in order to protect and defend the rights of the church (which he perſonates) by a perpetual ſucceſſion.

Blackſt. Comment.

ceſſion. He is ſometimes called the *rector* or *governor* of the church; but the appellation of *parſon* (however it may be depreciated by familiar, clowniſh, and indiſcriminate uſe) is the moſt legal, moſt beneficial, and moſt honourable title that a pariſh prieſt can enjoy; becauſe ſuch a one (Sir Edward Coke obſerves), and he only, is ſaid *vicem ſeu perſonam eccleſiæ gerere*. A parſon has, during his life, the freehold in himſelf of the parſonage houſe, the glebe, the tithes, and other dues. But theſe are ſometimes *appropriated;* that is to ſay, the benefice is perpetually annexed to ſome ſpiritual corporation, either ſole or aggregate, being the patron of the living; whom the law eſteems equally capable of providing for the ſervice of the church as any ſingle private clergyman †.

† See *Appropriation.*

The appropriating corporations, or religious houſes, were wont to depute one of their own body to perform divine ſervice, and adminiſter the ſacraments, in thoſe pariſhes of which the ſociety was thus the parſon. This officiating miniſter was in reality no more than a curate, deputy, or vicegerent of the appropriator, and therefore called *vicarius*, or "vicar." His ſtipend was at the diſcretion of the appropriator, who was, however, bound of common right to find ſomebody, *qui illi de temporalibus, epiſcopo de ſpiritualibus, debeat reſpondere*. But this was done in ſo ſcandalous a manner, and the pariſhes ſuffered ſo much by the neglect of the appropriators, that the legiſlature was forced to interpoſe: and accordingly it is enacted, by ſtatute 15 Rich. II. c. 6. that in all appropriations of churches the dioceſan biſhop ſhall ordain (in proportion to the value of the church) a competent ſum to be diſtributed among the poor pariſhioners annually; and that the vicarage ſhall be ſufficiently endowed. It ſeems the pariſh were frequently ſufferers, not only by the want of divine ſervice, but alſo by withholding thoſe alms for which, among other purpoſes, the payment of tithes was originally impoſed: and therefore in this act a penſion is directed to be diſtributed among the poor parochians, as well as a ſufficient ſtipend to the vicar. But he, being liable to be removed at the pleaſure of the appropriator, was not likely to inſiſt too rigidly on the legal ſufficiency of the ſtipend; and therefore, by ſtatute 4 Hen. IV. c. 12. it is ordained, that the vicar ſhall be a ſecular perſon, not a member of any religious houſe; that he ſhall be vicar perpetual, not removeable at the caprice of the monaſtery; and that he ſhould be canonically inſtituted and inducted, and be ſufficiently endowed, at the diſcretion of the ordinary; for theſe three expreſs purpoſes, to do divine ſervice, to inform the people, and to keep hoſpitality. The endowments, in conſequence of theſe ſtatutes, have uſually been by a portion of the glebe or land belonging to the parſonage, and a particular ſhare of the tithes, which the appropriators found it moſt troubleſome to collect, and which are therefore generally called *petty* or *ſmall tithes;* the greater, or perdial tithes, being ſtill reſerved to their own uſe. But one and the ſame rule was not obſerved in the endowment of all vicarages. Hence ſome are more liberally, and ſome more ſcantily, endowed: and hence the tithes of many things, as wood in particular, are in ſome pariſhes rectorial, and in ſome vicarial tithes.

The diſtinction therefore of a parſon and vicar is this: The parſon has for the moſt part the whole right to all the eccleſiaſtical dues in his pariſh; but a vicar has generally an appropriator over him, entitled to the beſt part of the profits, to whom he is in effect perpetual curate, with a ſtanding ſalary. Though in ſome places the vicarage has been conſiderably augmented by a large ſhare of the great tithes; which augmentations were greatly aſſiſted by the ſtatute 27 Car. II. c. 8. enacted in favour of poor vicars and curates, which rendered ſuch temporary augmentations (when made by the appropriators) perpetual.

The method of becoming a parſon or vicar is much the ſame. To both there are four requiſites neceſſary; holy orders, preſentation, inſtitution, and induction. The method of conferring the holy orders of deacon and prieſt, according to the liturgy and canons, is foreign to the preſent purpoſe; any farther than as they are neceſſary requiſites to make a complete parſon or vicar. By common law, a deacon, of any age, might be inſtituted and inducted to a parſonage or vicarage; but it was ordained, by ſtatute 13 Eliz. c. 12. that no perſon under twenty-three years of age, and in deacon's orders, ſhould be preſented to any benefice with cure; and if he were not ordained prieſt within one year after his induction, he ſhould be *ipſo facto* deprived: and now, by ſtatute 13 and 14 Car. II. c. 4. no perſon is capable to be admitted to any benefice, unleſs he hath been firſt ordained a prieſt; and then he is, in the language of the law, a clerk in orders. But if he obtains orders, or a licenſe to preach, by money or corrupt practices, (which ſeems to be the true, though not the common, notion of ſimony), the perſon giving ſuch orders forfeits 40l. and the perſon receiving, 10l. and is incapable of any eccleſiaſtical preferment for ſeven years after.

Any clerk may be preſented to a parſonage or vicarage; that is, the patron, to whom the advowſon of the church belongs, may offer his clerk to the biſhop of the dioceſe to be inſtituted. But when he is preſented, the biſhop may refuſe him upon many accounts. As, 1. If the patron is excommunicated, and remains in contempt 40 days; or, 2. If the clerk be unfit: which unfitneſs is of ſeveral kinds. Firſt, With regard to his perſon; as if he be a baſtard, an outlaw, an excommunicate, an alien, under age, or the like. Next, With regard to his faith or morals; as for any particular hereſy, or vice that is *malum in ſe;* but if the biſhop alleges only in generals, as that he is *ſchiſmaticus inveteratus*, or objects a fault that is *malum prohibitum* merely, as haunting taverns, playing at unlawful games, or the like, it is not good cauſe of refuſal. Or, laſtly, The clerk may be unfit to diſcharge the paſtoral office for want of learning. In any of which caſes, the biſhop may refuſe the clerk. In caſe the refuſal is for hereſy, ſchiſm, inability of learning, or other matter of eccleſiaſtical cognizance, there the biſhop muſt give notice to the patron of ſuch his cauſe of refuſal, who being uſually a layman, is not ſuppoſed to have knowledge of it; elſe he cannot preſent by lapſe; but if the cauſe be temporal, there he is not bound to give notice.

If an action at law be brought by the patron againſt the biſhop for refuſing his clerk, the biſhop muſt aſſign the cauſe. If the cauſe be of a temporal nature, and the fact admitted, (as, for inſtance, outlawry), the judges of the king's courts muſt determine its validity, or whether it be ſufficient cauſe of refuſal: but if the act be denied, it muſt be determined by a jury. If the cauſe be of a ſpiritual nature, (as hereſy, particularly alleged), the fact, if denied, ſhall alſo be determined by a jury: and if the fact be admitted or found, the court, upon conſultation and advice of learned divines, ſhall decide its ſufficiency. If the cauſe be want of learning, the biſhop need not ſpecify in what points the clerk is deficient, but only allege that he is deficient; for the ſtatute 9 Edw. II. ſt. 1. c. 13. is expreſs, that the examination of the fitneſs of a perſon preſented to a benefice belongs to the eccleſiaſtical judge. But becauſe it would be nugatory in this caſe to demand the reaſon of refuſal from the ordinary, if the patron were bound to abide by his determination, who has already pronounced his clerk unfit; therefore if the biſhop returns the clerk to be *minus ſufficiens in literatura*, the court ſhall write to the metropolitan to re-examine him, and certify his qualifications; which certificate of the archbiſhop is final.

If the biſhop hath no objections, but admits the patron's preſentation, the clerk ſo admitted is next to be inſtituted by him; which is a kind of inveſtiture of the ſpiritual part of the benefice; for by inſtitution, the care of the ſouls of the pariſh is committed to the charge of the clerk. When a vicar is inſtituted, he (beſides the uſual forms) takes, if required by the biſhop, an oath of perpetual reſidence; for the maxim of law is, that *vicarius non habet vicarium*: and as the non-reſidence of the appropriators was the cauſe of the perpetual eſtabliſhment of vicarages, the law judges it very improper for them to defeat the end of their conſtitution, and by abſence to create the very miſchief which they were appointed to remedy; eſpecially as, if any profits are to ariſe from putting in a curate and living at a diſtance from the pariſh, the appropriator, who is the real parſon, has undoubtedly the elder title to them. When the ordinary is alſo the patron, and confers the living, the preſentation and inſtitution are one and the ſame act, and are called a *collation to a benefice*. By inſtitution or collation the church is full, ſo that there can be no freſh preſentation till another vacancy, at leaſt in the caſe of a common patron; but the church is not full againſt the king till induction: nay, even if a clerk is inſtituted upon the king's preſentation, the crown may revoke it before induction, and preſent another clerk. Upon inſtitution alſo the clerk may enter on the parſonage houſe and glebe, and take the tithes; but he cannot grant or let them, or bring an action for them, till induction. See INDUCTION.

For the rights of a parſon or vicar, in his tithes and eccleſiaſtical dues, ſee TITHES. As to his duties, they are ſo numerous, that it is impracticable to recite them here with any tolerable conciſeneſs or accuracy; but the reader who has occaſion may conſult *Biſhop Gibſon's Codex*, *Johnſon's Clergyman's Vade Mecum*, and *Burn's Eccleſiaſtical Law*. We ſhall therefore only juſt mention the article of reſidence, upon the ſuppoſition of which the law doth ſtyle every parochial miniſter an incumbent. By ſtatute 21 Henry VIII. c. 13. perſons willingly abſenting themſelves from their benefices, for one month together, or two months in the year, incur a penalty of 5l. to the king, and 5l. to any perſon that will ſue for the ſame; except chaplains to the king, or others therein mentioned, during their attendance in the houſehold of ſuch as retain them; and alſo except all heads of houſes, magiſtrates, and profeſſors in the univerſities, and all ſtudents under forty years of age reſiding there, *bona fide*, for ſtudy. Legal reſidence is not only in the pariſh, but alſo in the parſonage houſe; for it hath been reſolved, that the ſtatute intended reſidence, not only for ſerving the cure and for hoſpitality, but alſo for maintaining the houſe, that the ſucceſſor alſo may keep hoſpitality there.

We have ſeen that there is but one way whereby one may become a parſon or vicar: there are many ways by which one may ceaſe to be ſo. 1. By death. 2. By ceſſion, in taking another benefice; for by ſtatute 21 Hen. VIII. c. 13. if any one having a benefice of 8l. *per annum*, or upwards, in the king's books, (according to the preſent valuation), accepts any other, the firſt ſhall be adjudged void, unleſs he obtains a diſpenſation; which no one is entitled to have but the chaplains of the king and others therein mentioned, the brethren and ſons of lords and knights, and doctors and bachelors of divinity and law, admitted by the univerſities of this realm. And a vacancy thus made for want of a diſpenſation, is called *ceſſion*. 3. By conſecration; for, as was mentioned before, when a clerk is promoted to a biſhopric, all his other preferments are void the inſtant that he is conſecrated. But there is a method, by the favour of the crown, of holding ſuch livings *in commendam*. *Commenda*, or *eccleſia commendata*, is a living commended by the crown to the care of a clerk, to hold till a proper paſtor is provided for it. This may be temporary for one, two, or three years, or perpetual, being a kind of diſpenſation to avoid the vacancy of the living, and is called a *commenda retinere*. There is alſo a *commenda recipere*, which is to take a benefice *de novo* in the biſhop's own gift, or the gift of ſome other patron conſenting to the ſame; and this is the ſame to him as inſtitution and induction are to another clerk. 4. By reſignation. But this is of no avail till accepted by the ordinary, into whoſe hands the reſignation muſt be made. 5. By deprivation, either by canonical cenſures, or in purſuance of divers penal ſtatutes, which declare the benefice void, for ſome nonfeaſance or neglect, or elſe ſome malefeaſance or crime: as for ſimony; for maintaining any doctrine in derogation of the king's ſupremacy, or of the thirty-nine articles, or of the book of common prayer; for neglecting after inſtitution to read the liturgy and articles in the church, or make the declarations againſt Popery, or take the abjuration oath; for uſing any other form of prayer than the liturgy of the church of England; or for abſenting himſelf 60 days in one year from a benefice belonging to a Popiſh patron, to which the clerk was preſented by either of the univerſities: in all which, and ſimilar caſes, the benefice is *ipſo facto* void, without any formal ſentence of deprivation.

PARSONAGE, a rectory, or pariſh church, endowed with a glebe, houſe, lands, tithes, &c. for the maintenance of a miniſter, with cure of ſouls within ſuch pariſh. See PARSON.

PARSONS, or PERSONS (Robert), an eminent writer of the church of Rome, was born at Nether-Stowey, near Bridgewater, in Somerſetſhire, in 1546, and educated at Baliol college, Oxford, where he diſtinguiſhed himſelf as a zealous Proteſtant and an acute diſputant; but being charged by the ſociety with incontinency and embezzling the college money, he went to Flanders, and declared himſelf a Catholic. After travelling to ſeveral other places, he effected the eſtabliſhment of the Engliſh ſeminary at Rome, and procured Father Allen to be choſen rector of it. He himſelf was appointed the head of the miſſion to England, in order to dethrone Queen Elizabeth, and if poſſible extirpate the Proteſtant religion. He accordingly came over to this kingdom in 1580, and took ſome bold ſteps towards accompliſhing his purpoſe, in which he concealed himſelf with great art, travelling about the country to gentlemen's houſes, diſguiſed in the habit ſometimes of a ſoldier, ſometimes of a gentleman, and at other times like a miniſter or an apparitor; but Father Campian being ſeized and committed to priſon, our author eſcaped out of England for fear of the ſame fate, and went to Rome, where he was made rector of the Engliſh ſeminary. He had long entertained the moſt ſanguine hopes of converting to the Popiſh faith the young king of Scots, which he conſidered as the beſt and moſt effectual means of bringing over his ſubjects to the ſame religious principles; but finding it impoſſible to ſucceed in his deſign, he publiſhed in 1594 his celebrated book, under the feigned name of *Doleman*, in order to overthrow, as far as lay in his power, the title of that prince to the crown of England. He died at Rome in 1610, and was buried in the chapel of the Engliſh college. Beſides the book already mentioned, he wrote, 1. A Defence of the Catholic Hierarchy. 2. The Liturgy of the Sacrament of the Maſs. 3. A Memorial for the Reformation: and ſeveral other tracts.

PART, a portion of ſome whole, conſidered as divided or diviſible.

Logical PART, is a diviſion for which we are indebted to the ſchoolmen. It refers to ſome univerſal as its whole; in which ſenſe the ſpecies are parts of a genus, and individuals or ſingulars are parts of the ſpecies.

Phyſical PART, is that which, though it enter the compoſition of a whole, may yet be conſidered apart, and under its own diſtinct idea; in which ſenſe, a continuum is ſaid to conſiſt of parts. Phyſical parts, again, are of two kinds, homogeneous and heterogeneous; the firſt are thoſe of the ſame denomination with ſome other; the ſecond of a different one: See HOMOGENEOUS, &c.) Parts, again, are diſtinguiſhed into ſubjective, eſſential, and integrant. The ſchoolmen were alſo the authors of this diviſion.

Aliquot PART, is a quantity which, being repeated any number of times, becomes equal to an integer. Thus 6 is an aliquot part of 24, and 5 an aliquot part of 30, &c.

Aliquant PART, is a quantity which, being repeated any number of times, becomes always either greater or leſs than the whole. Thus 5 is an aliquant part of 17, and 9 an aliquant part of 10, &c.

The aliquant part is reſolvable into aliquot parts. Thus 15, an aliquant part of 20, is reſolvable into $10\frac{1}{2}$, and 5 a fourth part of the ſame.

Parts of Speech, in grammar, are all the ſorts of words which can enter the compoſition of a diſcourſe. See GRAMMAR.

PARTERRE, in gardening, a level diviſion of ground, which for the moſt part faces the ſouth, or beſt front of a houſe, and is generally furniſhed with evergreens, flowers, &c. There are two kinds of theſe, the plain ones and the parterres of embroidery.

Plain parterres are moſt valuable in England, becauſe of the firmneſs of the Engliſh graſs turf, which is ſuperior to that of any other part of the world; and the parterres of embroidery are cut into ſhell and ſcroll work, with alleys between them. An oblong, or long ſquare, is accounted the moſt proper figure for a parterre; and a parterre ſhould indeed be always twice as long as it is broad, becauſe, according to the known laws of perſpective, a long ſquare always ſinks to a ſquare; and an exact ſquare always appears leſs than it really is. As to the breadth of a parterre, it is to be proportionable to the front of the houſe; but leſs than 100 feet in breadth is too little.

There ſhould be on each ſide the parterre a terrace walk raiſed for a view, and the flat of the parterre between the terraces ſhould never be more than 300 feet, at the utmoſt, in breadth; and about 140 feet in width, with twice and a half that in length, is eſteemed a very good ſize and proportion.

PARTHENIUM, in botany: A genus of the pentandria order, belonging to the monœcia claſs of plants; and in the natural method ranking under the 49th order, *Compoſitæ*. The male calyx is common and pentaphyllous; the florets of the diſk monopetalous: the female has five florets of the radius, each with two male florets behind it; the intermediate female ſuperior; the ſeed is naked.

Groſier's General Deſcription of China.

It has been much neglected in Europe, having on account of its ſmell been baniſhed from our parterres. It is therefore indebted for its culture to the diſtinguiſhed rank it holds among the Chineſe flowers. The ſkill of the floriſts, and their continual care, have brought this plant to ſo great perfection, that Europeans ſcarcely know it. The elegance and lightneſs of its branches, the beautiful indentation of its leaves, the ſplendour and duration of its flowers, ſeem indeed to juſtify the *florimania* of the Chineſe for this plant. They have, by their attention to its culture, procured more than 300 ſpecies of it: every year produces a new one. A liſt of the names of all theſe kinds would be equally tedious and diſguſting; we ſhall only ſay in general, that in its flowers are united all the poſſible combinations of ſhapes and colours. Its leaves are no leſs various: ſome of them are thin, other thick; ſome are very ſmall, and ſome large and broad; ſome are indented like thoſe of the oak, while others reſemble thoſe of the cherry tree; ſome may be ſeen cut in the form of fins, and others are found ſerrated on the margin, and tapering towards the points.

Parthenium is propagated in China by ſeed, and by ſuckers, grafts, and ſlips. When the floriſts have a fine plant, they ſuffer the ſeeds to ripen, and about the end of autumn ſow them in well prepared earth. Some keep them in this manner during winter, others ſow them in ſpring. Provided they are watered after the winter, they ſhoot forth, and grow rapidly. After the parthenium has flowered, all its branches are cut three inches from the root, the earth is hoed around, and a little dung is mixed with it; and when the cold becomes ſevere, the plant is covered with ſtraw, or an inverted pot. Thoſe that are in vaſes are tranſported to the greenhouſe, where they are not watered. In ſpring they are uncovered and watered, and they ſhoot forth a number of ſtems: of theſe ſome floriſts leave only two or three, others pull up the ſtalks together with the whole root, and divide it into ſeveral portions, which they tranſplant elſewhere. There are ſome who join two ſlips of different colours, in each of which, towards the bottom, they make the long notch, almoſt to the pith, and afterwards tie them together with packthread, that they may remain cloſely united: by theſe means they obtain beautiful flowers, variegated with whatever colours they chooſe.

Parthenium requires a good expoſure, and freſh moiſt air that circulates freely: when ſhut up cloſely by four walls, it ſoon languiſhes. The earth in which it is planted ought to be rich, moiſt, and loamy, and prepared with great care. For refreſhing it, the Chineſe uſe only rain or river water; and in ſpring time, they mix with this water the excrements of ſilk worms or the dung of their poultry; in ſummer, they leave the feathers of ducks or fowls to infuſe in it for ſeveral days, after having thrown into it a little ſaltpetre; but in autumn they mix with the water a greater or ſmaller quantity of dried excrement reduced to powder, according as the plant appears more or leſs vigorous. During the great heats of ſummer, they water it morning and evening; but they moiſten the leaves only in the morning: they alſo place ſmall fragments of brick round its roots, to prevent the water from preſſing down the earth too much. All this attention may appear trifling; but it is certain that it is founded upon experience and obſervation, and it is only by the aſſiſtance of ſuch minute care, that the patient and provident Chineſe has been able to procure, from a wild and almoſt ſtinking plant, ſo beautiful and odoriferous flowers. The more common ſpecies are, 1. Hyſterophorus. 2. Integrifolium.

Ancient diviſions.

PARTHIA, a celebrated empire of antiquity, bounded on the weſt by Media, on the north by Hyrcania, on the eaſt by Aria, on the ſouth by Carmania the deſert; ſurrounded on every ſide by mountains, which ſtill ſerve as a boundary, though its name is now changed, having obtained that of *Eyrac* or *Arac*; and to diſtinguiſh it from Chaldæa, that of *Eyrac Agami*. By Ptolemy it is divided into five diſtricts, *viz.* Caminſine, or Gamiſene, Parthyene, Choroane, Atticene, and Tabiene. The ancient geographers enumerate a great many cities in this country. Ptolemy in particular reckons 25 large cities; and it certainly muſt have been very populous, ſince we have accounts of 2000 villages, beſides a number of cities, in this diſtrict being deſtroyed by earthquakes. Its capital was named *Hecatompolis*, from the circumſtance of its having 100 gates. It was a noble and magnificent place; and, according to ſome, it ſtill remains under the name of *Iſpahan*, the capital of the preſent Perſian empire.

2
Whence peopled.

Parthia is by ſome ſuppoſed to have been firſt peopled by the Phetri or Pathri, often mentioned in Scripture, who will have the Parthians to be deſcended from Pathruſim the ſon of Miſraim. But however true this may be with regard to the ancient inhabitants, yet it is certain, that thoſe Parthians who were ſo famous in hiſtory, deſcended from the Scythians, though from what tribe we are not certainly informed.

3
Cauſe of the Parthians revolt from Antiochus Theus.

The hiſtory of the ancient Parthians is totally loſt. All that we know about them is, that they were firſt ſubject to the Medes, afterwards to the Perſians, and laſtly to Alexander the Great. After his death the province fell to Seleucus Nicator, and was held by him and his ſucceſſors till the reign of Antiochus Theus, about the year 250 before Chriſt. At this time the Parthians revolted, and choſe one Arſaces for their king. The immediate cauſe of this revolt was the lewdneſs of Agathocles, to whom Antiochus had committed the care of all the provinces beyond the Euphrates. This man made an infamous attempt on Tiridates, a youth of great beauty; which ſo enraged his brother Arſaces, that he excited his countrymen to revolt; and before Antiochus had leiſure to attend to the rebellion, it became too powerful to be cruſhed. Seleucus Callinicus, the ſucceſſor of Antiochus Theus, attempted to reduce Arſaces; but the latter having had ſo much time to ſtrengthen himſelf, defeated and drove his antagoniſt out of the country. Seleucus, however, in a ſhort time, undertook another expedition againſt Arſaces; but was ſtill more unfortunate than he had been in the former, being not only defeated in a great battle, but taken priſoner, and died in captivity. The day on which Arſaces gained this victory was ever after obſerved among the Parthians as an extraordinary feſtival. Arſaces being thus fully eſtabliſhed in his new kingdom, reduced Hyrcania and ſome other provinces under his power; and was at laſt killed in a battle againſt Ariarathes IV. king of Cappadocia. From this prince all the other kings of Parthia took the ſurname of *Arſaces*, as thoſe of Egypt did that of *Ptolemy* from Ptolemy Soter.

Arſaces I. was ſucceeded by his ſon Arſaces II. who, entering Media, made himſelf maſter of that country, while Antiochus the Great was engaged in a war with Ptolemy Euergetes king of Egypt. Antiochus, however, was no ſooner diſengaged from that war, than he marched with all his forces againſt Arſaces, and at firſt drove him quite out of Media. But he ſoon returned with an army of 100,000 foot and 20,000 horſe, with which he put a ſtop to the further progreſs of Antiochus; and a treaty was ſoon after concluded, in which it was agreed, that Arſaces ſhould remain maſter of Parthia and Hyrcania, upon condition of his aſſiſting him in his wars with other nations.

Conqueſts of the Parthian monarchs.

Arſaces II. was ſucceeded by his ſon Priapatius, who reigned 15 years, and left three ſons, Phraates, Mithridates, and Artabanus. Phraates, the eldeſt, ſucceeded to the throne, and reduced under his ſubjection the Mardi, who had never been conquered by any but Alexander the Great. After him, his brother Mithridates was inveſted with the regal dignity. He reduced the Bactrians, Medes, Perſians, Elymeans, and overran in a manner all the eaſt, penetrating beyond the boundaries of Alexander's conqueſts. Demetrius Nicator, who then reigned in Syria, endeavoured to recover thoſe provinces; but his army was entirely deſtroyed, and himſelf taken priſoner, in which ſtate he remained till his death; after which victory Mithridates made himſelf maſter of Babylonia and Meſopotamia, ſo that he now commanded all the provinces from between the Euphrates and the Ganges.

Antiochus Sidetes deſtroyed with his whole army.

Mithridates died in the 37th year of his reign, and left the throne to his ſon Phrahates II. who was ſcarce ſettled in his kingdom when Antiochus Sidetes marched againſt him at the head of a numerous army, under pretence of delivering his brother Demetrius, who was ſtill in captivity. Phrahates was defeated in three pitched battles; in conſequence of which he loſt all the countries conquered by his father, and was reduced within the limits of the ancient Parthian kingdom. Antiochus did not, however, long enjoy his good fortune; for his army, on account of their number, amounting to no fewer than 400,000, being obliged to ſeparate to ſuch diſtances as prevented them, in caſe of any ſudden attack, from joining together, the inhabitants, whom they had moſt cruelly oppreſſed, taking advantage of this ſeparation, conſpired with the Parthians to deſtroy them. This was accordingly executed; and the vaſt army of Antiochus, with the monarch himſelf, were ſlaughtered in one day, ſcarce a ſingle perſon eſcaping to carry the news to Syria. Phrahates, elated with this ſucceſs, propoſed to invade Syria; but in the mean time, happening to quarrel with the Scythians, he was by them cut off with his whole army, and was ſucceeded by his uncle Artabanus.

6
Alliance concluded with the Romans.

The new king enjoyed his dignity but a very ſhort time, being, a few days after his acceſſion, killed in another battle with the Scythians. He was ſucceeded by Pacorus I. who entered into an alliance with the Romans; and he by Phrahates III. This monarch took under his protection Tigranes the ſon of Tigranes the Great, king of Armenia, gave him his daughter in marriage, and invaded the kingdom with a deſign to place the ſon on the throne of Armenia; but on the approach of Pompey he thought proper to retire, and ſoon after ſolemnly renewed the treaty with the Romans.

Craſſus reſolves on a war with the Parthians.

Phrahates was murdered by his children Mithridates and Orodes; and ſoon after the former was put to death by his brother, who thus became ſole maſter of the Parthian empire. In his reign happened the memorable war with the Romans under Craſſus. This was occaſioned not by any breach of treaty on the ſide of the Parthians, but through the ſhameful avarice of Craſſus. The whole Roman empire at that time had been divided between Cæſar, Pompey, and Craſſus; and by virtue of that partition, the eaſtern provinces had fallen to the lot of Craſſus. No ſooner was he inveſted with this dignity, than he reſolved to carry the war into Parthia, in order to enrich himſelf with the ſpoils of that people, who were then looked upon to be very wealthy. Some of the tribunes oppoſed him, as the Parthians had religiouſly obſerved the treaty; but Craſſus having, by the aſſiſtance of Pompey, carried every thing before him, left Rome in the year 55 B. C. and purſued his march to Brunduſium, where he immediately embarked his troops, though the wind blew very high; and after a difficult paſſage, where he loſt many of his ſhips, he reached the ports of Galatia.

8
Plunders the temple at Jeruſalem.

From Galatia Craſſus haſtened to Syria, and paſſing through Judea, plundered the temple at Jeruſalem in his way. He then marched with as great expedition as he could to the river Euphrates, which he croſſed on a bridge of boats: and, entering the Parthian dominions, began hoſtilities. As the enemy had not expected an invaſion, they were quite unprepared for reſiſtance; and therefore Craſſus overran all Meſopotamia; and if he had taken advantage of the conſternation which the Parthians were in, might have alſo reduced Babylonia. But inſtead of this, early in the autumn, he repaſſed the Euphrates, leaving only 7000 foot and 1000 horſe to garriſon the places he had reduced; and putting his army into winter quarters in Syria, gave himſelf totally up to his favourite paſſion of amaſſing money.

Early in the ſpring, the Roman general drew his forces out of their winter quarters, in order to purſue the war with vigour; but, during the winter, Orodes had collected a very numerous army, and was well prepared to oppoſe him. Before he entered upon action, however, the Parthian monarch ſent ambaſſadors to Craſſus, in order to expoſtulate with him on his injuſtice in attacking an ally of the Roman empire; but Craſſus, without attending to what they ſaid, only returned for anſwer, that " they ſhould have his anſwer at Seleucia.

9
His ſoldiers diſheartened.

Orodes, finding that a war was not to be avoided, divided his army into two bodies. One he commanded in perſon, and marched towards Armenia, in order to oppoſe the king of that country, who had raiſed a conſiderable army to aſſiſt the Romans. The other he ſent into Meſopotamia, under the command of Surena or Surenas, a moſt experienced general, by whoſe conduct all the cities which Craſſus had reduced were quickly retaken. On this ſome Roman ſoldiers who made their eſcape, and fled to the camp of Craſſus, filled the minds of his army with terror at the accounts of the number, power, and ſtrength, of the enemy. They told their fellow ſoldiers, that the Parthians were very numerous, brave, and well diſciplined; that it was impoſſible to overtake them when they fled, or eſcape them when they purſued; that their defenſive weapons were proof againſt the Roman darts, and their offenſive weapons ſo ſharp, that no buckler was proof againſt them, &c. Craſſus looked upon all this only as the effect of cowardice: but the common ſoldiers, and even many of the chief officers, were ſo diſheartened, that Caſſius, the ſame who afterwards conſpired againſt Cæſar, and moſt of the legionary tribunes, adviſed Craſſus to ſuſpend his march, and conſider better of the enterpriſe before he proceeded farther in it. But Craſſus obſtinately perſiſted in his former reſolution, being encouraged by the arrival of Artabazus king of Armenia, who brought with him 6000 horſe, and promiſed to ſend 10,000 cuiraſſiers and 30,000 foot, whenever he ſhould ſtand in need of them. At the ſame time, he adviſed him by no means to march his army through the plains of Meſopotamia, but to take his route over the mountains of Armenia. He told him, that as Armenia was a mountainous country, the enemy's cavalry, in which their main ſtrength conſiſted, would there be entirely uſeleſs; and beſides, his army would there be plentifully ſupplied with all manner of neceſſaries: whereas, if he marched by the way of Meſopotamia, he would be perpetually haraſſed by the Parthian horſe, and frequently be obliged to lead his army through ſandy deſerts, where he would be diſtreſſed for want of water and all other proviſions. This ſalutary advice, however, was rejected, and Craſſus entered Meſopotamia with an army of about 40,000 men.

The Romans had no ſooner croſſed the Euphrates, than Caſſius adviſed his general to advance to ſome of thoſe towns in which the garriſons yet remained, in order to halt and refreſh his troops: or if he did not chooſe to follow this advice, he ſaid that his beſt way would be to march along the banks of the Euphrates to Seleucia; as by this method he would prevent the Parthians from ſurrounding him, at the ſame time that he would be plentifully ſupplied with proviſions from his ſhips. Of this advice Craſſus ſeemed to approve; but was diſſuaded by Abgarus king of Edeſſa, whom the Romans took for an ally, but who was in reality a traitor ſent by Surenas to bring about the deſtruction of the Roman army.

10
Betrayed by Abgarus, king of Edeſſa.

Under the conduct of this faithleſs guide, the Romans entered a vaſt green plain divided by many rivulets. Their march proved very eaſy through this fine country; but the farther they advanced, the worſe the roads became, inſomuch that they were at laſt obliged to climb up rocky mountains, which brought them to a dry and ſandy plain, where they could neither find food to ſatiſfy their hunger, nor water to quench their thirſt. Abgarus then began to be ſuſpected by the tribunes and other officers, who earneſtly entreated Craſſus not to follow him any longer, but to retreat to the mountains; at the ſame time an expreſs arrived from Artabazus, acquainting the Roman general that Orodes had invaded his dominions with a great army, and that he was obliged to keep his troops at home, in order to defend his own dominions. The ſame meſſenger adviſed Craſſus in his maſter's name to avoid by all means the barren plains, where his army would certainly periſh with hunger and fatigue, and by all means to approach Armenia, that they might join their forces againſt the common enemy. But all was to no purpoſe; Craſſus, inſtead of hearkening either to the advice of the king or his own officers, firſt flew into a violent paſſion with the meſſengers of Artabazus, and then told his troops, that they were not to expect the delights of Campania in the moſt remote parts of the world.

Thus they continued their march for ſome days croſs a deſert, the very ſight of which was ſufficient to throw them into the utmoſt deſpair; for they could not perceive, either near them or at a diſtance, the leaſt tree, plant, or brook, not ſo much as a hill, or a ſingle blade of graſs; nothing was to be ſeen all around them but huge heaps of burning ſand. The Romans had ſcarcely got through this deſert, when word was brought them by their ſcouts, that a numerous army of Parthians was advancing full march to attack them; for Abgarus, under pretence of going out on parties, had often conferred with Surenas, and concerted meaſures with him for deſtroying the Roman army. Upon this advice, which occaſioned great confuſion in the camp, the Romans being quite exhauſted and tired out with their long and troubleſome march, Craſſus drew up his men in battalia, following at firſt the advice of Caſſius, who was for extending the infantry as wide as poſſible, that they might take up the more ground, and by that means prevent the enemy from ſurrounding them: but Abgarus aſſuring the proconſul that the Parthian forces were not ſo numerous as was repreſented, he changed this diſpoſition, and believing only the man who betrayed him, drew up his troops in a ſquare, which faced every way, and had on each ſide 12 cohorts in front. Near each cohort he placed a troop of horſe to ſupport them, that they might charge with the greater ſecurity and boldneſs. Thus the whole army looked more like one phalanx than troops drawn up in manipuli, with ſpaces between them, after the Roman manner. The general himſelf commanded in the centre, his ſon in the left wing, and Caſſius in the right.

In this order they advanced to the banks of a ſmall river called the *Baliſſus*, the ſight of which was very pleaſing to the ſoldiers, who were much haraſſed with drought and exceſſive heat. Moſt of the officers were for encamping on the banks of this river, or rather rivulet, to give the troops time to refreſh themſelves after the fatigues of ſo long and painful a march; and, in the mean time, to procure certain intelligence of the number and diſpoſition of the Parthian army; but Craſſus, ſuffering himſelf to be hurried on by the inconſiderate ardour of his ſon, and the horſe he commanded, only allowed the legions to take a meal ſtanding; and before this could be done by all, he ordered them to advance, not ſlowly, and halting now and then, after the Roman manner, but as faſt as they could move, till they came in ſight of the enemy, who, contrary to their expectation, did not appear either ſo numerous or ſo terrible as they had been repreſented; but this was a ſtratagem of Surenas, who had concealed his men in convenient places, ordering them to cover their arms, leſt their brightneſs ſhould betray them, and, ſtarting up at the firſt ſignal, to attack the enemy on all ſides. The ſtratagem had the deſired effect; for Surenas no ſooner gave the ſignal, than the Parthians, riſing as it were out of the ground, with dreadful cries, and a moſt frightful noiſe, advanced againſt the Romans, who were greatly ſurpriſed and diſmayed at the ſight; and much more ſo, when the Parthians, throwing off the covering of their arms, appeared in ſhining cuiraſſes, and helmets of burniſhed ſteel, finely mounted on horſes covered all over with armour of the ſame metal. At their head appeared young Surenas, in a rich dreſs, who was the firſt who charged the enemy, endeavouring, with his pikemen, to break through the firſt ranks of the Roman army; but finding it too cloſe and impenetrable, the cohorts ſupporting each other, he fell back, and retired in a ſeeming confuſion: but the Romans were much ſurpriſed when they ſaw themſelves ſuddenly ſurrounded on all ſides, and galled with continual ſhowers of arrows. Craſſus ordered his light armed foot and archers to advance, and charge the enemy; but they were ſoon repulſed, and forced to cover themſelves behind the heavy armed foot. Then the Parthian horſe, advanced near the Romans, diſcharged ſhowers of arrows upon them, every one of which did execution, the legionaries being drawn up in ſuch cloſe order, that it was impoſſible for the enemy to miſs their aim. As their arrows were of an extraordinary weight, and diſcharged with incredible force and impetuoſity, nothing was proof againſt them. The two wings advanced in good order to repulſe them, but to no effect; for the Parthians ſhot their arrows with as great dexterity when their backs were turned,

11
The battle of Carrhæ.

as when they faced the enemy ; ſo that the Romans, whether they kept their ground, or purſued the flying enemy, were equally annoyed with their fatal arrows.

The Romans, as long as they had any hopes that the Parthians, after having ſpent their arrows, would either betake themſelves to flight, or engage them hand to hand, ſtood their ground with great reſolution and intrepidity; but when they obſerved that there were a great many camels in their rear loaded with arrows, and that thoſe who emptied their quivers wheeled about to fill them anew, they began to loſe courage, and loudly to complain of their general for ſuffering them thus to ſtand ſtill, and ſerve only as a butt to the enemy's arrows, which, they well ſaw, would not be exhauſted till they were all killed to a man. Hereupon Craſſus ordered his ſon to advance, at all adventures, and attack the enemy with 1300 horſe, 500 archers, and 8 cohorts. But the Parthians no ſooner ſaw this choice body (for it was the flower of the army) marching up againſt them, than they wheeled about, and betook themſelves, according to their cuſtom, to flight. Hereupon young Craſſus, crying out as loud as he could, *They fly before us*, puſhed on full ſpeed after them, not doubting but he ſhould gain a complete victory; but when he was at a great diſtance from the main body of the Roman army, he perceived his miſtake; for thoſe who before had fled, facing about, charged him with incredible fury. Young Craſſus ordered his troops to halt, hoping that the enemy, upon ſeeing their ſmall number, would not be afraid to come to a cloſe fight: but herein he was likewiſe greatly diſappointed; for the Parthians, contenting themſelves to oppoſe his front with their heavy armed horſe, ſurrounded him on all ſides; and, keeping at a diſtance, diſcharged inceſſant ſhowers of arrows upon the unfortunate Romans, thus ſurrounded and pent up. The Parthian cavalry, in wheeling about, raiſed ſo thick a duſt, that the Romans could ſcarce ſee one another, much leſs the enemy: nevertheleſs, they found themſelves wounded with arrows, though they could not perceive whence they came. In a ſhort time the place where they ſtood was all ſtrown with dead bodies.

12
Extreme diſtreſs of the Romans.

Some of the unhappy Romans finding their entrails torn, and many overcome by the exquiſite torments they ſuffered, rolled themſelves in the ſand with the arrows in their bodies, and expired in that manner. Others endeavouring to tear out by force the bearded points of the arrows, only made the wounds the larger and increaſed their pain. Moſt of them died in this manner; and thoſe who outlived their companions were no more in a condition to act; for when young Craſſus exhorted them to march up to the enemy, ſome ſhowed him their wounded bodies, others their hands nailed to their bucklers, and ſome their feet pierced through and pinned to the ground; ſo that it was equally impoſſible for them either to attack the enemy or defend themſelves. The young commander, therefore, leaving his infantry to the mercy of the enemy, advanced at the head of the cavalry againſt their heavy armed horſe. The thouſand Gauls whom he had brought with him from the weſt, charged the enemy with incredible boldneſs and vigour; but their lances did little execution on men armed with cuiraſſes, and horſes covered with tried armour: however, they behaved with great reſolution; for ſome of them taking hold of the enemy's ſpears, and cloſing with them, threw them off their horſes on the ground, where they lay without being able to ſtir, by reaſon of the great weight of their armour; others, diſmounting, crept under the enemy's horſes, and thruſting their ſwords into their bellies, made them throw their riders. Thus the brave Gauls fought, though greatly haraſſed with heat and thirſt, which they were not accuſtomed to bear, till moſt of their horſes were killed, and their commander dangerouſly wounded. They then thought it adviſable to retire to their infantry, which they no ſooner joined, than the Parthians inveſted them anew, making a moſt dreadful havock of them with their arrows. In this deſperate condition, Craſſus, ſpying a riſing ground at a ſmall diſtance, led the remains of his detachment thither, with a deſign to defend himſelf in the beſt manner he could, till ſuccours ſhould be ſent him from his father. The Parthians purſued him; and having ſurrounded him in his new poſt, continued ſhowering arrows upon his men, till moſt of them were either killed or diſabled, without being able to make uſe of their arms, or give the enemy proofs of their valour.

13
The death of young Craſſus.

Young Craſſus had two Greeks with him, who had ſettled in the city of Carrhæ. Theſe, touched with compaſſion, at ſeeing ſo brave a man reduced to ſuch ſtraits, preſſed him to retire with them to the neighbouring city of Iſchnes, which had declared for the Romans; but the young Roman rejected their propoſal with indignation, telling them, that he would rather die a thouſand times than abandon ſo many valiant men, who ſacrificed their lives for his ſake. Having returned this anſwer to his two Greek friends, he embraced and diſmiſſed them, giving them leave to retire and ſhift for themſelves in the beſt manner they could. As for himſelf, having now loſt all hopes of being relieved, and ſeeing moſt of his men and friends killed round him, he gave way to his grief; and, not being able to make uſe of his arm, which was ſhot through with a large barbed arrow, he preſented his ſide to one of his attendants, and ordered him to put an end to his unhappy life. His example was followed by Cenſorius a ſenator, by Megabacchus an experienced and brave officer, and by moſt of the nobility who ſerved under him. Five hundred common ſoldiers were taken priſoners, and the reſt cut in pieces.

The Parthians, having thus cut off or taken the whole detachment commanded by young Craſſus, marched without delay againſt his father who, upon the firſt advice that the enemy fled before his ſon, and were cloſely purſued by him, had taken heart, the more becauſe thoſe who had remained to make head againſt him ſeemed to abate much of their ardour, the greateſt part of them having marched with the reſt againſt his ſon. Wherefore, having encouraged his troops, he had retired to a ſmall hill in his rear, to wait there till his ſon returned from the purſuit. Young Craſſus had deſpatched frequent expreſſes to his father, to acquaint him with the danger he was in; but they had fallen into the enemy's hands, and been by them put to the ſword: only the laſt, who had eſcaped with great difficulty, arrived ſafe, and informed him that his ſon was loſt if he did not ſend him an immediate and powerful reinforcement. This news threw Craſſus into the utmoſt conſternation; a thouſand affecting thoughts roſe in his mind, and diſturbed his reaſon to ſuch a degree, that he ſcarce knew what he was doing. However, the deſire he had of ſaving his ſon, and ſo many brave Romans who were under his command, made him immediately decamp, and march to their aſſiſtance; but he was not gone far before he was met by the Parthians, who, with loud ſhouts, and ſongs of victory, gave, at a diſtance, the unhappy father notice of his misfortune. They had cut off young Craſſus's head, and, having fixed it on the point of a lance, were advancing full ſpeed to fall on the father. As they drew near, Craſſus was ſtruck with that diſmal and affecting ſight; but, on this occaſion, behaved like a hero: for though he was under the deepeſt concern, he had the preſence of mind to ſtifle his grief, for fear of diſcouraging the army, and to cry out to the diſmayed troops, "This misfortune is entirely mine; the loſs of one man cannot affect the victory: Let us charge, let us fight like Romans: if you have any compaſſion for a father who has juſt now loſt a ſon whoſe valour you admired, let it appear in your rage and reſentment againſt theſe inſulting barbarians." Thus Craſſus ſtrove to reanimate his troops; but his efforts were unſucceſsful: their courage was quite ſunk, as appeared from the faint and languiſhing ſhout which they raiſed, according to cuſtom, before the action. When the ſignal was given, the Parthians, keeping to their old way of fighting, diſcharged clouds of arrows on the legionaries, without drawing near them; which did ſuch dreadful execution, that many of the Romans, to avoid the arrows, which occaſioned a long and painful death, threw themſelves, like men in deſpair, on the enemy's heavy-armed horſe, ſeeking from their ſpears a more quick and eaſy kind of death. Thus the Parthians continued plying them inceſſantly with their arrows till night, when they left the field of battle, crying out, that they would allow the father one night to lament the death of his ſon.

14 Diſtreſs of Craſſus.

This was a melancholy night for the Romans. Craſſus kept himſelf concealed from the ſoldiery, lying not in the general's tent, but in the open air, and on the bare ground, with his head wrapped up in his paludamentum or military cloak: and was, in that forlorn condition, ſays Plutarch, a great example to the vulgar, of the inſtability of fortune; to the wiſe, a ſtill greater of the pernicious effects of avarice, temerity, and ambition. Octavius, one of his lieutenants, and Caſſius, approached him, and endeavoured to raiſe him up and conſole him: but, ſeeing him quite ſunk under the weight of his affliction, and deaf to all comfort, they ſummoned a council of war, compoſed of all the chief officers; wherein it was unanimouſly reſolved, that they ſhould decamp before break of day, and retire, without ſound of trumpet, to the neighbouring city of Carrhæ, which was held by a Roman garriſon. Agreeable to this reſolution, they began their march as ſoon as the council broke up; which produced dreadful outcries among the ſick and wounded, who, perceiving that they were to be abandoned to the mercy of the enemy, filled the camp with their complaints and lamentations: but their cries and tears, though very affecting, did not ſtop the march of the others, which, indeed, was very ſlow, to give the ſtragglers time to come up. There were only 300 light horſe, under the command of one Ægnatius, who purſued their march without ſtopping. Theſe arriving at Carrhæ about midnight, Ægnatius, calling to the centinels on the walls, deſired them to acquaint Coponius, governor of the place, that Craſſus had fought a great battle with the Parthians; and, without ſaying a word more, or letting them know who he was, continued his march with all poſſible expedition to the bridge of Zeugma; which he paſſed, and by that means ſaved his troops, but was much blamed for abandoning his general.

However, the meſſage he ſent to Coponius was of ſome temporary ſervice to Craſſus. For that commander, wiſely conjecturing, from the manner in which the unknown perſon had given him that intelligence, that ſome misfortune had befallen Craſſus, immediately ordered his garriſon to ſtand to their arms; and, marching out, met Craſſus, and conducted him and his army into the city: for the Parthians, though informed of his flight, did not offer to purſue him, obſerving therein the ſuperſtitious cuſtom which obtained among them and the Perſians, not to fight in the night; but when it was day, they entered the Roman camp, and having put all the wounded, to the number of 4000, to the ſword, diſperſed their cavalry all over the plain, in purſuit of the fugitives. One of Craſſus's lieutenants, named *Vargunteius*, having ſeparated in the night from the main body of the army, with four cohorts, miſſed his way, and was overtaken by the enemy; at whoſe approach he withdrew to a neighbouring hill, where he defended himſelf, with great valour, till all his men were killed, except 20, who made their way through the enemy ſword in hand, and got ſafe to Carrhæ: but Vargunteius himſelf loſt his life on this occaſion.

15 Surenas pretends to confer with Craſſus.

In the mean time Surenas, not knowing whether Craſſus and Caſſius had retired to Carrhæ, or choſen a different route; in order to be informed of the truth, and take his meaſures accordingly, deſpatched a meſſenger, who ſpoke the Roman language, to the city of Carrhæ, enjoining him to approach the walls, and acquaint Craſſus himſelf, or Caſſius, that the Parthian general was inclined to enter into a treaty with them, and demanded a conference. Both the proconſul and his quæſtor Caſſius ſpoke from the walls with the meſſenger; and, accepting the propoſal with great joy, deſired that the time and place for an interview might be immediately agreed upon. The meſſenger withdrew, promiſing to return quickly with an anſwer from Surenas: but that general no ſooner underſtood that Craſſus and Caſſius were in Carrhæ, than he marched thither with his whole army; and, having inveſted the place, acquainted the Romans, that if they expected any favourable terms, they muſt deliver up Craſſus and Caſſius to him in chains. Hereupon a council of the chief officers being ſummoned, it was thought expedient to retire from Carrhæ that very night, and ſeek for another aſylum. It was of the utmoſt importance that none of the inhabitants of Carrhæ ſhould be acquainted with their deſign till the time of its execution; but Craſſus, whoſe whole conduct evidently ſhows that he was blinded, as Dio Caſſius obſerves, by ſome divinity, imparted the whole matter in confidence to one Andromachus, chooſing him for his guide, and relying injudiciouſly on the fidelity of a man whom he ſcarce knew. Andromachus immediately acquainted Surenas with the deſign of the Romans; promiſing at the ſame time, as the Parthians did not engage in the night, to manage matters ſo, that they ſhould not get out of his reach before daybreak. Purſuant to his promiſe, he led them through many windings and turnings, till he brought them into deep marſhy grounds, where the infantry were up to the knees in mire. Then Caſſius, ſuſpecting that their guide had led them into thoſe bogs with no good deſign, refuſed to follow him any longer; and returning to Carrhæ, took his route towards Syria, which he reached with 500 horſe. Octavius, with 5000 men under his command, being conducted by truſty guides, gained the mountains called by Plutarch and Appian *Sinnaci*, and there intrenched himſelf before break of day.

As for Craſſus, he was ſtill entangled in the marſhes, when Surenas, at the riſing of the ſun, overtook him, and inveſted him with his cavalry. The proconſul had with him four cohorts, and a ſmall body of horſe; and with theſe he gained, in ſpite of all oppoſition, the ſummit of another hill within 12 furlongs of Octavius; who ſeeing the danger that threatened his general, flew to his aſſiſtance, firſt with a ſmall number of his men, but was ſoon followed by all the reſt, who, being aſhamed of their cowardice, quitted their poſt, tho' very ſafe, and, charging the Parthians with great fury, diſengaged Craſſus, and obliged the enemy to abandon the hill. Upon the retreat of the enemy, they formed themſelves into a hollow ſquare; and placing Craſſus in the middle, made a kind of rampart round him with their bucklers, reſolutely proteſting, that none of the enemy's arrows ſhould touch their general's body, till they were all killed fighting in his defence. Surenas, loth to let ſo fine a prey eſcape, ſurrounded the hill, as if he deſigned to make a new attack: but, finding his Parthians very backward, and not doubting but the Romans, when night came on, would purſue their march, and get out of his reach, he had recourſe again to artifice; and declared before ſome priſoners, whom he ſoon after ſet at liberty, that he was inclined to treat with the proconſul of a peace; and that it was better to come to a reconciliation with Rome, than to ſow the ſeeds of an eternal war, by ſhedding the blood of one of her generals.

Agreeable to this declaration, Surenas, as ſoon as the priſoners were releaſed, advanced towards the hill where the Romans were poſted, attended only by ſome of his officers, and, with his bow unbent, and open arms, invited Craſſus to an interview. So ſudden a change ſeemed very ſuſpicious to the proconſul; who therefore declined the interview, till he was forced, by his own ſoldiers, to intruſt his life with an enemy whoſe treachery they had all experienced; for the legionaries flocking round him, not only abuſed him in an outrageous manner, but even menaced him if he did not accept of the propoſals made him by the Parthian general. Seeing, therefore, that his troops were ready to mutiny, he began to advance, without arms or guards, towards the enemy, after having called the gods and his officers to witneſs the violence his troops offered him; and entreated all who were preſent, but eſpecially Octavius and Petronius, two of the chief commanders, for the honour of Rome their common mother, not to mention, after his death, the ſhameful behaviour of the Roman legionaries. Octavius and Petronius could not reſolve to let him go alone; but attended him down the hill, as did likewiſe ſome legionaries, keeping at a diſtance. Craſſus was met at the foot of the hill by two Greeks who, diſmounting from their horſes, ſaluted him with great reſpect: and deſired him in the Greek tongue, to ſend ſome of his attendants, who might ſatisfy him that Surenas, and thoſe who were with him, came without arms. Hereupon Craſſus ſent two brothers, of the Roſcian family; but Surenas having cauſed them to be ſeized, advanced to the foot of the hill, mounted on a fine horſe, and attended by the chief officers of his army. Craſſus, who waited for the return of his two meſſengers, was ſurpriſed to ſee himſelf prevented by Surenas in perſon, when he leaſt expected it. The Parthian general, perceiving, as he approached Craſſus, that he was on foot, cried out, in a ſeeming ſurpriſe, "What do I ſee? a Roman general on foot, and we on horſeback! Let a horſe be brought for him immediately." "You need not be ſurpriſed (replied Craſſus): we are come only to an interview, each after the cuſtom of his country." "Very well (anſwered Surenas), there ſhall be henceforth a laſting peace between King Orodes and the people of Rome: but we muſt ſign the articles of it on the banks of the Euphrates; for you Romans do not always remember your conventions." Craſſus would have ſent for a horſe: but a very ſtately one with a golden bit, and richly capariſoned, was brought to him by a Parthian; which Surenas preſenting to him, "Accept this horſe from my hands (ſaid he), which I give you in the name of my maſter King Orodes." He had ſcarce uttered theſe words, when ſome of the king's officers, taking Craſſus by the middle, ſet him upon the horſe, which they began to whip with great violence before them in order to make him quicken his pace. Octavius, offended at this inſult, took the horſe by the bridle; Petronius and the few Romans who were preſent, ſeconded him, and flocking all round Craſſus, ſtopped his horſe. The Parthians endeavoured to repulſe them, and clear the way for the proconſul; whereupon they began to juſtle and puſh one another with great tumult and diſorder. At laſt, Octavius, drawing his ſword, killed one of the king's grooms; but, at the ſame time, another coming behind Octavius, with one blow laid him dead at his feet. Both parties fought with great reſolution, the Parthians ſtriving to carry off Craſſus, and the Romans to reſcue him out of their hands. In this ſcuffle moſt of the Romans who came to the conference were killed; and, 16
among the reſt, Craſſus himſelf, but whether by a Roman or a Parthian is uncertain. C
killed

Upon his death, the reſt of the army either ſurrendered to the enemy, or, diſperſing in the night, were purſued, and put to the ſword. The Romans loſt in this campaign at leaſt 30,000 men; of which 20,000 were killed, and 10,000 taken priſoners.

When the battle of Carrhæ was fought, King Orodes was in Armenia, where he had made peace with Artabazus.

bazus. While the two kings were ſolemnizing their new alliance with expenſive and public feaſts, Styllaces or Syllaces, a Parthian officer, whom Surenas had ſent with the news of his late victory, and the head of Craſſus as a proof of it, arrived in the capital of Armenia. The tranſports of joy which Orodes felt at this ſight, and theſe news, are not to be expreſſed; and the lords of both kingdoms, who attended their ſovereigns, raiſed loud and repeated ſhouts of joy. Syllaces was ordered to give a more particular and diſtinct account of that memorable action; which when he had done, Orodes commanded melted gold to be poured into Craſſus's mouth; reproaching him thereby with avarice, which had been always his predominant paſſion.

17 Surenas put to death by Orodes.

Surenas did not long enjoy the pleaſure of his victory; for Orodes, jealous of his power and authority among the Parthians, ſoon after cauſed him to be put to death. Pacorus, the king's favourite ſon was put at the head of the army; and agreeably to his father's directions, invaded Syria: but he was driven out from thence with great loſs by Cicero and Caſſius, the only general who ſurvived the defeat of Craſſus. After this we find no mention of the Parthians, till the time of the civil war between Cæſar and Pompey, when the latter ſent ambaſſadors to ſolicit ſuccour againſt his rival. This Orodes was willing to grant upon condition that Syria was delivered up to him; but as Pompey would not conſent to ſuch a propoſal, the ſuccours were not only denied, but, after the battle of Pharſalia, he put Lucius Hirtius in irons, whom Pompey had again ſent to aſk aſſiſtance, or at leaſt to deſire leave to ſhelter himſelf in the Parthian dominions.

18 War commenced againſt the Parthians by Mark Antony.

19 Pacorus defeated and killed by Ventidius.

Cæſar is ſaid to have meditated a war againſt the Parthians, which in all probability would have proved fatal to them. His death delivered them from this danger. But, not long after, the eaſtern provinces, being grievouſly oppreſſed by Mark Antony, roſe up in arms; and having killed the tax-gatherers, invited the Parthians to join them and drive out the Romans. They very readily accepted the invitation, and croſſed the Euphrates with a powerful army under the command of Pacorus, and Labienus a Roman general of Pompey's party. At firſt they met with great ſucceſs, overran all Aſia Minor, and reduced all the countries as far as the Helleſpont and the Egæan ſea, ſubduing likewiſe Phœnicia, Syria, and even Judea. They did not however long enjoy their new conqueſts: for being elated with their victories, and deſpiſing the enemy, they engaged Ventidius, Antony's lieutenant, before Labienus had time to join them, and were utterly defeated. This ſo diſheartened Labienus's army, that they all abandoned him; and he himſelf, being thus obliged to wander from place to place in diſguiſe, was at laſt taken and put to death at Cyprus. Ventidius purſuing his advantage, gained ſeveral other victories; and at laſt entirely defeated the Parthian army under Pacorus, cutting almoſt the whole of them in pieces, and the prince himſelf among the reſt. He did not, however, purſue this laſt victory as he might have done; being afraid of giving umbrage to Antony, who had already become jealous of the great honour gained by his lieutenant. He therefore contented himſelf with reducing thoſe places in Syria and Phœnicia which the Parthians had taken in the beginning of the war, until Antony arrived to take the command of the army upon himſelf.

20 Orodes murdered.

Orodes was almoſt diſtracted with grief on receiving the dreadful news of the loſs of his army and the death of his favourite ſon. However, when time had reſtored the uſe of his faculties, he appointed Phrahates, the eldeſt but the moſt wicked, of all his children, to ſucceed him in the kingdom, admitting him at the ſame time to a ſhare of the ſovereign authority with himſelf. The conſequence of this was, that Phrahates very ſoon attempted to poiſon his father with hemlock. But this contrary to expectation, proving a cure for the dropſy, which an exceſs of grief had brought upon the king, the unnatural ſon had him ſtifled in bed, and ſoon after not only murdered all his own brethren, who were thirty in number, but cut off all the reſt of the royal family, not ſparing even his own eldeſt ſon, leſt the diſcontented Parthians ſhould place him, as he was already of age, on the throne.

Many of the chief lords of Parthia being intimidated by the cruelty of Phrahates, retired into foreign countries: and among thoſe one Monœſes, a perſon of great diſtinction, as well as ſkill and experience in war. This man, having fled to Antony, ſoon gained his confidence, and was by him eaſily prevailed upon to engage in a war againſt his countrymen. But Phrahates juſtly dreading the conſequences of ſuch a perſon's defection, ſent a ſolemn embaſſy to invite him home on ſuch terms as he ſhould think fit to accept; which greatly provoked Antony; though he did not hinder him from returning, leſt others ſhould thereby be diſcouraged from coming over to him. He therefore diſmiſſed him with great civility, ſending ambaſſadors at the ſame time to Phrahates to treat of a peace. Thus he hoped to divert the Parthian monarch's attention from making the neceſſary preparations for war, and that he ſhould be able to fall upon him on the ſpring when he was in no condition to make reſiſtance. But herein he was greatly diſappointed; for on his arrival at the Euphrates, which he intended to paſs, and enter the Parthian dominions on that ſide, he found all the paſſes ſo well guarded, that he thought proper to enter Media with a deſign firſt to reduce that country, and then to enter Parthia.

21 Antony betrayed by Artabazus, king of Armenia.

This plan had been ſuggeſted to him by Artabazus king of Armenia, who in the end betrayed him; for inſtead of conducting the army the ſtraight way from Zeugma on the Euphrates, to the Araxes which parted Media from Armenia, and which was about 500 miles diſtant from the place whence he firſt ſet out, Artabazus led them over the rocks and mountains ſo far about, that the army had marched above 1000 miles before they reached the borders of Media, where they intended to begin the war. Thus they were not only greatly fatigued but had not ſufficient time, the year being far ſpent, to put in execution the deſign on which they had come. However, as Antony was impatient to get back to Cleopatra, he left behind him moſt of the baggage of the army, and 300 waggons loaded with battering rams and other military engines for ſieges; appointing Statianus, one of his lieutenants, with a body of 10,000 men, to guard them, and to bring them, by ſlower marches, after the

22
Ten thouſand Romans cut off.

army. With the reſt of the forces he marched more than 300 miles before the reſt, without allowing his men any reſpite till he arrived at Praaſpa or Phrahata, the capital of Media, which he immediately inveſted. But the Parthians, well knowing that he could not make any progreſs without his military machines, paſſed by his army, in order to attack Statianus; which they did with ſuch ſucceſs, that the body commanded by him were all to a man cut off, and all their military engines taken, among which was a battering ram 80 feet long.

Antony, notwithſtanding this diſaſter, continued the ſiege of Praaſpa; but was daily haraſſed by ſallies of the garriſon from within, and the enemy's army without. At laſt he began to think of a retreat when his proviſions were almoſt exhauſted, finding it impoſſible to become maſter of the city. But as he was to march 300 miles through the enemy's country, he thought proper firſt to ſend ambaſſadors to the Parthian monarch, acquainting him that the Roman people were willing to allow him a peace, provided he would reſtore the ſtandards and priſoners taken at Carrhæ. Phrahates received the ambaſſadors, ſitting on a golden throne; and, after having bitterly inveighed againſt the avarice and unbounded ambition of the Romans, told them that he would not part with the ſtandards and priſoners; but that if Antony would immediately raiſe the ſiege of Praaſpa, he would ſuffer him to retire unmoleſted.

23
Antony leaves Parthia in great diſtreſs.

Antony, who was reduced to great ſtraits, no ſooner received this anſwer than he broke up the ſiege, and marched towards Armenia. However, Phrahates was not ſo good as his word; for the Romans were attacked by the enemy no fewer than 18 times on their march, and were thrice in the utmoſt danger of being cut off. A famine alſo raged in the Roman army; upon which they began to deſert to the enemy; and indeed Antony would probably have been left by himſelf, had not the Parthians, in a very cruel as well as impolitic manner, murdered all thoſe who fled to them in ſight of the reſt. At laſt, after having loſt 32,000 men, and being reduced to ſuch deſpair that he was with difficulty prevented from laying violent hands on himſelf, he reached the river Araxes; when his men, finding themſelves out of the reach of the enemy, fell down on the ground, and kiſſed it with tears of joy.

Antony was no ſooner gone, than the kings of Media and Parthia quarrelled about the booty they had taken; and after various conteſts Phrahates reduced all Media and Armenia. After this, being elated with his conqueſts, he oppreſſed his ſubjects in ſuch a cruel and tyrannical manner, that a civil war took place; in which the competitors were alternately driven out and reſtored, till the year 50, when one Vologeſes, the ſon of Gotarzes, a former king, became peaceable poſſeſſor of the throne. He carried on ſome wars againſt the Romans, but with very indifferent ſucceſs, and at laſt gladly conſented to a renewal of the ancient treaties with that powerful people.

24
Parthia ſubdued by Trajan.

From this time the Parthian hiſtory affords nothing remarkable till the reign of the emperor Trajan; when the Parthian king, by name *Coſdroes*, infringed the treaty with Rome, by driving out the king of Armenia. Upon this Trajan, who was glad of any pretence to quarrel with the Parthians, immediately haſtened into Armenia. His arrival there was ſo ſudden and unexpected, that he reduced almoſt the whole country without oppoſition; and took priſoner Parthamaſiris, the king whom the Parthians had ſet up. After this he entered Meſopotamia, took the city of Niſibis, and reduced to a Roman province the whole of that wealthy country.

Early in the ſpring of the following year, Trajan, who had kept his winter quarters in Syria, took the field again; but was warmly oppoſed by Coſdroes.—He found him encamped on the banks of the Euphrates, with a deſign to diſpute his paſſage: which he did with ſuch vigour, that the emperor, after having ſeveral times attempted to ford that river, and been always repulſed with great ſlaughter, was obliged to cauſe boats to be built on the neighbouring mountains, which he privately conveyed from thence on carriages to the water ſide; and having in the night time formed a bridge with them, he paſſed his army the next day; but not without great loſs and danger, the Parthians haraſſing his men the whole time with inceſſant ſhowers of arrows, which did great execution. Having gained the oppoſite bank, he advanced boldly into Aſſyria, the Parthians flying everywhere before him, and made himſelf maſter of Arbela. Thence he purſued his march; ſubduing, with incredible rapidity, countries where the Roman ſtandard had never been diſplayed before. Babylonia, or the province of Babylon, voluntarily ſubmitted to him. The city itſelf was, after a vigorous reſiſtance, taken by ſtorm; by which means he became maſter of all Chaldea and Aſſyria, the two richeſt provinces of the Parthian empire. From Babylon he marched to Cteſiphon, the metropolis of the Parthian monarchy; which he beſieged, and at laſt reduced. But as to the particulars of theſe great conqueſts, we are quite in the dark; this expedition, however glorious to the Roman name, being rather hinted at than deſcribed, by the writers of thoſe times. While Trajan was thus making war in the heart of the enemy's country, Coſdroes, having recruited his army, marched into Meſopotamia, with a deſign to recover that country, and cut off all communication between the Roman army and Syria. On his arrival in that province, the inhabitants flocked to him from all parts; and moſt of the cities, driving out the garriſons left by Trajan, opened their gates to him. Hereupon the emperor detached Lucius and Maximus, two of his chief commanders, into Meſopotamia, to keep ſuch cities in awe as had not revolted, and to open a communication with Syria. Maximus was met by Coſdroes; and having ventured a battle, his army was entirely defeated, and himſelf killed. But Lucius being joined by Euricius and Clarius, two other commanders ſent by Trajan with freſh ſupplies, gained conſiderable advantages over the enemy, and retook the cities of Niſibis and Seleucia, which had revolted.

And now Trajan, ſeeing himſelf poſſeſſed of all the beſt and moſt fruitful provinces of the Parthian empire, but at the ſame time being well appriſed that he could not, without a vaſt expence, maintain his conqueſts, nor keep in ſubjection ſo fierce and warlike a people at ſuch a diſtance from Italy; reſolved to ſet over them a king of his own chooſing, who ſhould hold the crown of him and his ſucceſſors, and acknowledge

them

25 Parthanaſpates appointed king by the Roman emperor, but ſoon after driven out.

them as his lords and ſovereigns. With this view he repaired to Cteſiphon; and having there aſſembled the chief men of the nation, he crowned one of the royal family, by name *Parthanaſpates*, king of Parthia, obliging all who were preſent to pay him their allegiance. He choſe Parthanaſpates, becauſe that prince had joined him at his firſt entering the Parthian dominions, conducted him with great fidelity, and ſhown on all occaſions an extraordinary attachment to the Romans. Thus the Parthians were at laſt ſubdued, and their kingdom made tributary to Rome. But they did not long continue in this ſtate of ſubjection: for they no ſooner heard of Trajan's death, which happened ſhortly after, than, taking up arms, they drove Parthanaſpates from the throne; and recalling Coſdroes, who had retired into the country of the Hyrcanians, openly revolted from Rome. Adrian, who was then commander in chief of all the forces in the eaſt, and ſoon after acknowledged emperor by the army, did not care, though he was at that time in Syria with a very numerous army, to engage in a new war with the Parthians; but contented himſelf with preſerving the ancient limits of the empire, without any ambitious proſpects of further conqueſts. Therefore, in the beginning of his reign, he abandoned thoſe provinces beyond the Euphrates which Trajan had conquered; withdrew the Roman garriſons from Meſopotamia; and, for the greater ſafety of other places, made the Euphrates the boundary of, and barrier in, thoſe parts, poſting his legions along the banks of that river.

26 Unſucceſsful wars of Vologeſes with the Romans.

Coſdroes died after a long reign, and was ſucceeded by his eldeſt ſon Vologeſes: in whoſe reign the Alani breaking into Media, then ſubject to the Parthians, committed there great devaſtations; but were prevailed upon, with rich preſents ſent them by Vologeſes, to abandon that kingdom, and return home. Upon their retreat, Vologeſes, having no enemy to contend with at home, fell unexpectedly upon Armenia; ſurpriſed the legions there; and having cut them all in pieces to a man, entered Syria; defeated with great ſlaughter Attilius Cornelianus, governor of that province; and advanced without oppoſition to the neighbourhood of Antioch; putting everywhere the Romans, and thoſe who favoured them, to the ſword. Hereupon the emperor Verus, by the advice of his colleague Antoninus ſurnamed the *Philoſopher*, leaving Rome, haſtened into Syria: and having driven the Parthians out of that province, ordered Statius Priſcus to invade Armenia; and Caſſius, with Martius Verus to enter the Parthian territories, and carry the war into the enemy's country. Priſcus made himſelf maſter of Artaxata; and in one campaign drove the Parthians, though not without great loſs on his ſide, quite out of Armenia. Caſſius, on the other hand, having in ſeveral encounters defeated Vologeſes, tho' he had an army of 400,000 men under his command, reduced, in four years time, all thoſe provinces which had formerly ſubmitted to Trajan, took Seleucia, burnt and plundered the famous cities of Babylon and Cteſiphon, with the ſtately palaces of the Parthian monarchs, and ſtruck terror into the moſt remote provinces of that great empire. On his return, he loſt above half the number of his forces by ſickneſs and famine; ſo that, after all, the Romans, as Spartianus obſerves, had no great reaſon to boaſt of their victories and conqueſts.

However, Verus, who had never ſtirred during the whole time of the war from Antioch and Daphne, took upon him the lofty titles of *Parthicus* and *Armenicus*, as if he had acquired them juſtly in the midſt of his pleaſures and debaucheries. After the revolt and death of Caſſius, Antoninus the Philoſopher repaired into Syria to ſettle the affairs of that province. On his arrival there, he was met by ambaſſadors from Vologeſes; who having recovered moſt of the provinces ſubdued by Caſſius, and being unwilling either to part with them or engage in a new war, ſolicited the emperor to confirm him in the poſſeſſion of them, promiſing to hold them of him, and to acknowledge the ſovereignty of Rome. To theſe terms Antoninus readily agreed, and a peace was accordingly concluded between the two empires; which Vologeſes did not long enjoy, being ſoon after carried off by a diſtemper, and not murdered by his own ſubjects, as we read in Conſtantinus Manaſſes, who calls him *Belegeſes*.

27 Cteſiphon taken by Severus.

Upon his death, Vologeſes III. the ſon of his brother Sanatruces, and grandſon of Coſdroes, was raiſed to the throne. He ſided with Niger againſt the emperor Severus: who thereupon having ſettled matters at home, marched with all his forces againſt him; and advancing to the city of Cteſiphon, whither he had retired, laid cloſe ſiege to that metropolis. Vologeſes made a moſt gallant defence: but the city, after a long ſiege, and much bloodſhed on both ſides, was at length taken by aſſault. The king's treaſures, with his wives and children, fell into the emperor's hands: but Vologeſes himſelf had the good luck to make his eſcape; which was a great diſappointment to Severus, who immediately deſpatched an expreſs to acquaint the ſenate with the ſucceſs that had attended him in his expedition againſt the only nation that was then formidable to Rome. But he had no ſooner croſſed the Euphrates, than Vologeſes recovered all the provinces except Meſopotamia, which he had reduced. Theſe expeditions were chargeable to the Romans, and coſt them much blood, without reaping any advantages from them; for as they had not ſufficient forces to keep in awe the provinces they had ſubdued, the inhabitants, greatly attached to the family of Arſaces, never failed to return to their ancient obedience as ſoon as the Roman armies were withdrawn. Vologeſes was ſoon after engaged in a war ſtill more troubleſome and deſtructive, with his brother Artabanus, who, encouraged by ſome of the diſcontented nobles, attempted to rob him of the crown, and place it on his own head. Vologeſes gained ſeveral victories over his brother and rebellious ſubjects; but died before he could reſtore the empira to its former tranquillity.

Artabanus, who had a numerous army at his devotion, did not meet with any oppoſition in ſeizing the throne, vacant by the death of his brother, though Tiridates had a better title to it, as being his elder brother. He had ſcarce ſettled the affairs of his kingdom, when the emperor Caracalla, deſirous to ſignalize himſelf as ſome of his predeceſſors had done, by ſome memorable exploit againſt the Parthians, ſent a ſolemn embaſſy to him, deſiring his daughter in marriage. Artabanus, overjoyed at this propoſal, which

28 Infamous treachery of the emperor Caracalla.

which he thought would be attended with a laſting peace between the two empires, received the ambaſſadors with all poſſible marks of honour, and readily complied with their requeſt. Soon after, Caracalla ſent a ſecond embaſſy to acquaint the king that he was coming to ſolemnize the nuptials; whereupon Artabanus went to meet him attended with the chief of the nobility and his beſt troops, all unarmed, and in moſt pompous habits: but this peaceable train no ſooner approached the Roman army, than the ſoldiers, on a ſignal given them, falling upon the king's retinue, made a moſt terrible ſlaughter of the unarmed multitude, Artabanus himſelf eſcaping with great difficulty. The treacherous Caracalla, having gained by this exploit great booty, and, as he thought, no leſs glory, wrote a long and boaſting letter to the ſenate, aſſuming the title of *Parthicus* for this piece of treachery; as he had before that of *Germanicus*, for murdering, in like manner, ſome of the German nobility.

29 A deſperate battle between the Parthians and Ro-

Artabanus, reſolving to make the Romans pay dear for their inhuman and barbarous treachery, raiſed the moſt numerous army that had ever been known in Parthia, croſſed the Euphrates, and entered Syria, putting all to fire and ſword. But Caracalla being murdered before this invaſion, Macrinus, who had ſucceeded him, met the Parthians at the head of a mighty army, compoſed of many legions, and all the auxiliaries of the ſtates of Aſia. The two armies no ſooner came in ſight of each other, but they engaged with the utmoſt fury. The battle continued two days; both Romans and Parthians fighting ſo obſtinately, that night only parted them, without any apparent advantage on either ſide; though both retired when night had put an end to the conteſt, crying, Victory, victory. The field of battle was covered all over with dead bodies, there being already above 40,000 killed, including both Romans and Parthians: nevertheleſs Artabanus was heard to ſay, that the battle was only begun, and that he would continue it till either the Parthians or Romans were all to a man cut in pieces. But Macrinus, being well appriſed that the king came highly enraged againſt Caracalla in particular, and dreading the conſequences which would attend the deſtruction of his army, ſent a herald to Artabanus, acquainting him with the death of Caracalla, and propoſing an alliance between the two empires. The king, underſtanding that his great enemy was dead, readily embraced the propoſals of peace and amity, upon condition that all the priſoners who had been taken by the treachery of Caracalla ſhould be immediately reſtored, and a large ſum of money paid him to defray the expences of the war.

Theſe articles being performed without delay or heſitation, Artabanus returned into Parthia, and Macrinus to Antioch.

30 The Perſians revolt, and overthrow the Parthian empire.

As Artabanus loſt on this occaſion the flower of his army, Artaxerxes, a Perſian of mean deſcent, but of great courage and experience in war, revolting from the Parthians, prevailed on his countrymen to join him, and attempt the recovery of the ſovereign power, which he ſaid they had been unjuſtly deprived of, firſt by the Macedonians, and afterwards by the Parthians, their vaſſals. Artabanus, upon the news of this revolt, marched with the whole ſtrength of his kingdom to ſuppreſs it; but being met by Artaxerxes at the head of a no leſs powerful army, a bloody battle enſued, which is ſaid to have laſted three days. At length the Parthians, though they behaved with the utmoſt bravery, and fought like men in deſpair, were forced to yield to the Perſians, who were commanded by a more experienced leader. Moſt of their troops were cut off in the flight; and the king himſelf was taken priſoner, and ſoon after put to death at Artaxerxes's order. The Parthians, having loſt in this fatal engagement both their king and their army, were forced to ſubmit to the conqueror, and become vaſſals to a nation which had been ſubject to them for the ſpace of 475 years.

For an account of the manners, cuſtoms, &c. of the ancient Parthians, ſee the article Persia.

PARTI, Partie, *Party*, or *Parted*, in heraldry, is applied to a ſhield or eſcutcheon, denoting it divided or marked out into partitions.

Parti per pale, is when the ſhield is divided perpendicularly into two halves, by a cut in the middle from top to bottom.

Parti per feſs, is when the cut is acroſs the middle from ſide to ſide.

Parti per bend dexter, is when the cut comes from the upper corner of the ſhield on the right hand, and deſcends athwart to the oppoſite lower corner.

Parti per bend ſiniſter, is when the cut, coming from the upper left corner, deſcends acroſs to the oppoſite lower one.

All theſe partitions, according to M. de la Colombiere, have their origin from the cuts and bruiſes that have appeared on ſhields after engagements; and, being proofs of the dangers to which the bearers had been expoſed, they gained them eſteem: for which reaſon they were tranſmitted to poſterity, and became arms and marks of honour to their future families.

PARTIALITY. See *Self-partiality* and Prejudice.

PARTICIPLE, in grammar, an adjective formed of a verb; ſo called, becauſe it participates partly of the properties of a noun, and partly of thoſe of a verb. See Grammar.

PARTICLE, in phyſiology, the minute part of a body, an aſſemblage of which conſtitutes all natural bodies.

In the new philoſophy, particle is often uſed in the ſame ſenſe with atom in the ancient Epicurean philoſophy, and corpuſcle in the latter. Some writers, however, diſtinguiſh them; making particle an aſſemblage or compoſition of two or more primitive and phyſically indiviſible corpuſcles or atoms; and corpuſcle, or little body, an aſſemblage or maſs of ſeveral particles or ſecondary corpuſcles. The diſtinction, however, is of little moment; and, as to moſt purpoſes of phyſics, particle may be underſtood as ſynonymous with corpuſcle. Particles are then the elements of bodies: it is the various arrangement and texture of theſe, with the difference of the coheſion, &c. that conſtitute the various kinds of bodies, hard, ſoft, liquid, dry, heavy, light, &c. The ſmalleſt particles or corpuſcles cohere with the ſtrongeſt attractions, and always compoſe bigger particles of weaker coheſion; and many of theſe cohering compoſe bigger particles, whoſe vigour is ſtill weaker; and thus on for divers ſucceſſions, till the progreſſion end in the biggeſt particles, whereon the operations in chemiſtry, and the colours of natural bodies, depend, and which, by cohering, compoſe bodies of ſenſible bulks.

The coheſion of the particles of matter, according to the Epicureans, was effected by hooked atoms; the Ariſtotelians thought it managed by reſt, that is, by nothing at all. But Sir Iſaac Newton ſhows it is done by means of a certain power, whereby the particles mutually attract or tend towards each other, which is ſtill perhaps giving a fact without a cauſe. By this attraction of the particles he ſhows that moſt of the phenomena of the leſſer bodies are affected, as thoſe of the heavenly bodies are by the attraction of gravity. See Attraction and Cohesion.

Particle, a term in theology, uſed in the Latin church for the crumbs or little pieces of conſecrated bread, called in the Greek church *μεριδες*. The Greeks have a particular ceremony, called *των μεριδων, of the particles*, wherein certain crumbs of bread, not conſecrated, are offered up in honour of the Virgin, St John Baptiſt, and ſeveral other ſaints. They alſo give them the name of *προσφορα, oblatio*. Gabriel archbiſhop of Philadelphia wrote a little treatiſe expreſs *περι των μεριδων*, wherein he endeavours to ſhow the antiquity of this ceremony, in that it is mentioned in the liturgies of St Chryſoſtom and Baſil. There has been much controverſy on this head between the reformed and catholic divines. Aubertin and Blondel explain a paſſage in the theory of Germanus patriarch of Conſtantinople, where he mentions the ceremony of the particles as in uſe in his time, in favour of the former; Meſſieurs de Port Royal conteſt the explanation; but M. Simon, in his notes on Gabriel of Philadelphia, endeavours to ſhow that the paſſage itſelf is an interpolation, not being found in the ancient copies of Germanus, and conſequently that the diſpute is very ill grounded.

Organic Particles, are thoſe ſmall moving bodies which are imperceptible without the help of glaſſes; for beſides thoſe animals which are perceptible to the ſight, ſome naturaliſts reckon this exceedingly ſmall ſpecies as a ſeparate claſs, if not of animals properly ſo called, at leaſt of moving bodies, which are found in the ſemen of animals, and which cannot be ſeen without the help of the microſcope. In conſequence of theſe obſervations, different ſyſtems of generation have been propoſed concerning the ſpermatic worms of the male and the eggs of the female. In the ſecond volume of Buffon's Natural Hiſtory, ſeveral experiments are related, tending to ſhow that thoſe moving bodies which we diſcover by the help of glaſſes in the male ſemen are not real animals, but organic, lively, active, and indeſtructible molecules, which poſſeſs the property of becoming a new organized body ſimilar to that from which they were extracted. Buffon found ſuch bodies in the female as well as in the male ſemen; and he ſuppoſes that the moving bodies which he obſerved with the microſcope in infuſions of the germs of plants are likewiſe vegetable organic molecules. Needham, Wriſberg, Spalanzani, and ſeveral other writers on the animal economy, have purſued the ſame track with M. de Buffon.

Some ſuppoſe that theſe organic molecules in the ſemen anſwer no purpoſe but to excite the venereal deſire: but ſuch an opinion cannot be well founded; for eunuchs, who have no ſeminal liquor, are nevertheleſs ſubject to venereal deſire. With reſpect to the beautiful experiments which have been made with the microſcope on organic molecules, M. Bonnet, that learned and excellent obſerver of nature, remarks that they ſeem to carry us to the fartheſt verge of the ſenſible creation, did not reaſon teach us that the ſmalleſt viſible globule of ſeminal liquor is the commencement of another univerſe, which, from its infinite ſmallneſs, is beyond the reach of our beſt microſcopes. —*Animalcules*, properly ſo called, muſt not be confounded with the wonderful organic particles of Buffon. See Animalcule.

Particle, in grammar, a denomination for all thoſe ſmall words that tie or unite others, or that expreſs the modes or manners of words. See Grammar.

PARTING, in metallurgy. See Metallurgy.

Parting, in chemiſtry, an operation by which gold and ſilver are ſeparated from each other. As theſe two metals reſiſt equally well the action of fire and of lead, they muſt therefore be ſeparated by other methods. This ſeparation could not be effected if they were not ſoluble by different menſtruums.

Nitrous acid, marine acid, and ſulphur, which cannot diſſolve gold, attack ſilver very eaſily; and therefore theſe three agents furniſh methods of ſeparating ſilver from gold, or of the operation called *parting*.

Parting by nitrous acid is the moſt convenient, and therefore moſt uſed, and even almoſt the only one employed by goldſmiths and coiners: wherefore it is called ſimply *parting*. That made with the marine acid is only made by cementation, and is known by the name of *concentrated parting*. Laſtly, Parting by ſulphur is made by fuſion, which the chemiſts call the *dry way*, and is therefore called *dry parting*.

Parting by Aquafortis. Although parting by aquafortis be eaſy, as we have ſaid, it cannot however ſucceed or be very exact, unleſs we attend to ſome eſſential circumſtances.

1. The gold and ſilver muſt be in a proper proportion: for if the gold was in too great quantity, the ſilver would be covered and guarded by it from the action of the acid.

Therefore, when eſſayers do not know the proportion of theſe two metals in the maſs to be operated upon, they diſcover it by the following method.

They have a certain number of needles compoſed of gold and ſilver allayed together in graduated proportions, and the allay of each needle is known by a mark upon it. Theſe are called *proof needles*.

When eſſayers want to know nearly the proportion of gold and ſilver in a maſs, they rub this maſs upon a touchſtone, ſo as to leave a mark upon it. They then make marks upon the touchſtone with ſome of the needles the colour of which they think comes neareſt to that of the maſs. By comparing the marks of theſe needles with the mark of the maſs, they diſcover nearly the proportion of the gold and ſilver in the maſs.

If this trial ſhows, that in any given maſs the ſilver is not to the gold as three to one, this maſs is improper for the operation of parting by aquafortis. In this caſe, the quantity of ſilver neceſſary to make an allay of that proportion muſt be added.

This operation is called *quartation*, probably becauſe it reduces the gold to a fourth part of the whole maſs.

2. That the parting may be exact, the nitrous acid

or aquafortis employed muſt be very pure, and eſpecially free from mixture of vitriolic and marine acids. For if this was not attended to, a quantity of ſilver proportionable to theſe two foreign acids would be ſeparated during the ſolution ; and this portion of ſilver reduced by theſe acids to vitriol of ſilver and to luna cornea would remain mingled with the gold, which conſequently would not be entirely purified by the operation.

When the metallic maſs is properly allayed, it is to be reduced to plates, rolled up ſpirally, called cornets; or to grains. Theſe are to be put into a matraſs, and upon them a quantity of aquafortis is to be poured, the weight of which is to that of the ſilver as three to two: and as the nitrous acid employed for this operation is rather weak, the ſolution is aſſiſted, eſpecially at firſt, by the heat of a ſand bath, in which the matraſs is to be placed. When, notwithſtanding the heat, no further mark of ſolution appears, the aquafortis charged with ſilver is to be decanted. Freſh nitrous acid is to be poured into the matraſs, ſtronger than the former, and in leſs quantity, which muſt be boiled on the reſiduous maſs, and decanted as the former. Aquafortis muſt even be boiled a third time on the remaining gold, that all the ſilver may be certainly diſſolved. The gold is then to be waſhed with boiling water. This gold is very pure if the operation has been performed with due attention. It is called *gold of parting*.

No addition of ſilver is required, if the quantity of ſilver of the maſs is evidently much more conſiderable than that of the gold : perſons who have not proof needles and other apparatus to determine the proportion of the allay, may add to the gold an indeterminate quantity of ſilver, obſerving that this quantity be rather too great than too ſmall, and ſo conſiderable as to render the maſs nearly as white as ſilver; for a large quantity of ſilver is rather favourable than hurtful to the operation : It has no other inconvenience than an uſeleſs expence, as the larger the quantity is of ſilver the more aquafortis muſt be employed. We ought to attend to this fact, that the colour of gold is ſcarcely perceptible in a maſs two-thirds of which is ſilver and one-third is gold ; this colour then muſt be much leſs perceptible when the gold is only one-fourth part, or leſs, of the whole maſs.

If the quantity of gold exceeds that of the ſilver, the maſs may be expoſed to the action of aqua regia, which would be a kind of inverſe parting, becauſe the gold is diſolved in that menſtruum, and the ſilver is not, but rather reduced to a luna cornea, which remains in form of a precipitate after the operation. But this method is not much practiſed, for the following reaſons.

Firſt, The gold cannot be eaſily ſeparated from the aqua-regia : for if the parting has been made with an aqua-regia prepared with ſal ammoniac, or if the gold be precipitated by a volatile alkali, this gold has a fulminating quality, and its reduction requires particular operations. If the aqua-regia has been made with ſpirit of ſalt, and the precipitation effected by a fixed alkali, the gold will not then be fulminating, but the precipitation will be very ſlow, and probably incomplete.

Secondly, In the parting by aqua-regia, the ſilver is indeed precipitated into a lunea cornea, and thus ſeparated ; but this ſeparation is not perfect, as a ſmall quantity of luna cornea will always remain diſſolved by the acids, if this ſolution even could be only effected by the ſuperabundant water of theſe acids. Accordingly the ſilver is not ſo accurately ſeparated from the gold by aqua-regia, as the gold is from the ſilver by aquafortis.

The gold, after the parting by aquafortis, is much more eaſily collected when it remains in ſmall maſſes than when it is reduced to a powder.

When the maſs has been regularly quarted, that is, when it contains three parts of ſilver and one part of gold, we muſt employ, particularly for the firſt ſolution, an aquafortis ſo weakened that heat is required to aſſiſt the ſolution of the ſilver ; by which means the ſolution is made gently ; and the gold which remains preſerves the form of the ſmall maſſes before the ſolution. If the aquafortis employed were ſtronger, the parts of the gold would be diſunited and reduced to the form of a powder, from the activity with which the ſolution would be made.

We may indeed part by aquafortis a maſs containing two parts of ſilver to one part of gold : but then the aquafortis muſt be ſtronger ; and if the ſolution be not too much haſtened, the gold will more eaſily remain in maſſes after the operation. In both caſes, the gold will be found to be tarniſhed and blackened, probably from what was lately called the *phlogiſton* of the nitrous acid. Its parts have no adheſion together, becauſe the ſilver diſſolved from it has left many interſtices ; and the cornets or grains of this gold will be eaſily broken, unleſs they be handled very carefully. To give them more ſolidity, they are generally put into a teſt under a muffle and made red hot ; during which operation they contract conſiderably, and their parts are approximated. Theſe pieces of gold are then found to be rendered much more ſolid, ſo that they may be handled without being broken. By this operation alſo the gold reſumes its colour and luſtre ; and as it generally has the figure of cornets, it is called *gold in cornets*, or *grain gold*. Eſſayers avoid melting it, as they chooſe to preſerve this form, which ſhows that it has been parted.

The gold and ſilver thus operated upon ought to have been previouſly refined by lead, and freed from all allay of other metallic matters, ſo that the gold which remains ſhould be as pure as is poſſible. However, as this is the only metal which reſiſts the action of aquafortis, it might be purified by parting from all other metallic ſubſtances ; but this is not generally done, for ſeveral reaſons. Firſt, becauſe the refining by lead is more expeditious and convenient for the ſeparation of the gold from the imperfect metals ; ſecondly, becauſe the ſilver, when afterwards ſeparated from the aquafortis, is pure ; laſtly, becauſe moſt imperfect metals do not remain completely and entirely diſſolved in nitrous acid ; from the portion of phlogiſton which this acid deprives them of, the gold would be found after the parting mixed with the part of theſe metals which is precipitated.

The gold remaining after the parting ought to be well waſhed, to cleanſe it from any of the ſolution of ſilver which might adhere to it ; and for this purpoſe diſtilled water ought to be uſed, or at leaſt water the purity of which has been aſcertained by its not forming a precipitate with a ſolution of ſilver, becauſe ſuch a precipitate would alter the purity of the gold.

The ſilver diſſolved in the aquafortis may be ſeparated either by diſtillation, in which caſe all the aquafortis is recovered very pure, and fit for another parting; or it may be precipitated by ſome ſubſtance which has a greater affinity than this metal with nitrous acid. Copper is generally employed for this purpoſe at the mint.

The ſolution of ſilver is put into copper veſſels. The aquafortis diſſolves the copper, and the ſilver precipitates. When the ſilver is all precipitated, the new ſolution is decanted, which is then a ſolution of copper. The precipitate is to be well waſhed, and may be melted into an ingot. It is called *parted ſilver*. When this ſilver has been obtained from a maſs which had been refined by lead, and when it has been well waſhed from the ſolution of copper, it is very pure.

Mr Cramer obſerves juſtly in his Treatiſe on Eſſaying, that however accurately the operation of parting has been performed, a ſmall portion of ſilver always remains united with the gold, if the parting has been made by aquafortis; or a ſmall portion of the gold remains united with the ſilver, if the parting has been made by aqua-regia: and he eſtimates this ſmall allay to be from a two hundredth to a hundred and fiftieth part; which quantity may be conſidered as nothing for ordinary purpoſes, but may become ſenſible in accurate chemical experiments. *Chem. Dict.*

The maſs of gold and ſilver to be quarted ought previouſly to be granulated; which may be done by melting it in a crucible, and pouring it into a large veſſel full of cold water, while at the ſame time a rapid circular motion is given to the water by quickly ſtirring it round with a ſtick or broom.

The veſſels generally uſed for this operation, called *parting glaſſes*, have the form of truncated cones, the bottom being commonly about ſeven inches wide, the aperture about one or two inches wide, and the height about 12 inches. Theſe glaſs veſſels ought to have been well annealed, and choſen free from flaws; as one of the chief inconveniences attending the operation is, that the glaſſes are apt to crack by expoſure to cold, and even when touched by the hand. Some operators ſecure their glaſſes by a coating. For this purpoſe they ſpread a mixture of quicklime flaked with beer and whites of eggs upon linen cloth, which they wrap round the lower part of the veſſel, leaving the upper part uncovered, that they may ſee the progreſs of the operation; and over this cloth they apply a compoſition of clay and hair. Schlutter adviſes to put the parting glaſſes containing ſome water, and ſupported by trevets, with fire under them. When the heat communicated by the water is too great, it may be diminiſhed by adding cold water, which muſt be done very carefully by pouring againſt the ſides of the pan, to prevent too ſudden an application of cold to the parting glaſs. The intention of this contrivance is, that the contents of the glaſſes, if theſe ſhould break, may be received by the copper veſſel. Into a glaſs 15 inches high, and 10 or 12 inches wide at bottom, placed in a copper pan 12 inches wide at bottom, 15 inches wide at top, and 10 inches high, he uſually put about 80 ounces of metal, with twice as much aquafortis.

The aquafortis ought to be ſo ſtrong as to be capable of acting ſenſibly on ſilver when cold, but not ſo ſtrong as to act violently. If the aquafortis be very ſtrong, however pure, and if the veſſels be well cloſed, a ſmall quantity of the gold will be diſſolved along with the ſilver, which is to be guarded againſt.

Little heat ought to be applied at the beginning, the liquor being apt to ſwell and riſe over the veſſel; but when the acid is nearly ſaturated, the heat may be ſafely increaſed.

When the ſolution ceaſes, which may be known by the diſcontinuance of the efferveſcence, or emiſſion of air bubbles, the liquor is to be poured off. If any grains appear entire, more aquafortis muſt be added, that all the ſilver may be diſſolved. If the operation has been performed ſlowly, the remaining gold will have ſtill the form of diſtinct maſſes, which are to receive ſolidity and colour by fire, in the manner directed by the author of the dictionary. If the operation has been performed haſtily, the gold will have the appearance of a black mud or powder, which after five or ſix waſhings with pure water muſt be melted.

The ſilver is uſually recovered by precipitating it from the aquafortis by means of copper veſſels into which the liquor is poured, or of plates of copper which are thrown along with the liquor into glaſs veſſels. A conſiderable heat is required to accelerate this precipitation. Dr Lewis ſays, he has obſerved that when the aquafortis was perfectly ſaturated with ſilver, no precipitation was occaſioned by plates of copper, till a drop or two of aquafortis was added to the liquor, and then the precipitation began and continued as uſual.

The precipitated ſilver muſt be well waſhed in boiling water, and fuſed with ſome nitre; the uſe of which is to ſcorify any cupreous particles which may adhere to the ſilver.

From the ſolution of copper in aquafortis, a blue pigment, called *verditer*, is obtained by precipitation with whiting. *Notes to Chem. Dict.*

Concentrated PARTING, alſo called *Parting by Cementation*, becauſe it is actually performed by cementation, is uſed when the quantity of it is ſo great in proportion to the ſilver, that it cannot be ſeparated by aquafortis. This operation is done in the following manner.

A cement is firſt prepared, compoſed of four parts of bricks powdered and ſifted, of one part of green vitriol calcined till it becomes red, and of one part of common ſalt. The whole is very accurately mixed together, and a firm paſte is made of it by moiſtening it with a little water or urine. This cement is called *cement royal*, becauſe it is employed to purify gold, which is conſidered by chemiſts as the king of metals.

The gold to be cemented is to be reduced to plates as thin as ſmall pieces of money. At the bottom of the crucible or cementing pot, a ſtratum of cement, of the thickneſs of a finger, is to be put, which is to be covered with plates of gold; upon theſe another ſtratum of cement is to be laid, and then more plates of gold, till the crucible or pot is filled with theſe alternate ſtrata of cement and of gold. The whole is then to be covered with a lid, which is to be luted with a mixture of clay and ſand. This pot is to be placed in a furnace, or oven, and heated by degrees till it is moderately red, which heat is to be continued during 24 hours. The heat muſt not be ſo great as to melt the gold. The pot or crucible is then left to cool, and the gold is to be carefully ſeparated from the cement, and boiled at different times in a large quantity of pure water. This gold is to be eſſayed upon a touchſtone or otherwiſe; and if it be found not ſufficiently purified, it is to be cemented a ſecond time in the ſame manner.

The vitriolic acid of the bricks and of the calcined vitriol diſengages the acid of the common ſalt during this cementation: and this latter acid diſſolves the ſilver allayed with the gold, and ſeparates it by that means.

This experiment proves, that although marine acid, while it is liquid, cannot attack ſilver, it is nevertheleſs a powerful ſolvent of that metal. But for this purpoſe it muſt be applied to the ſilver in the ſtate of vapours, extremely concentrated, and aſſiſted with a conſiderable heat. All theſe circumſtances are united in the concentrated parting.

This experiment proves alſo, that notwithſtanding all theſe circumſtances, which favour the action of the marine acid, it is incapable of diſſolving gold.

Laſtly, The marine acid in this ſtate more effectually diſſolves the ſilver than the nitrous acid does in the parting by aquafortis, ſince this operation ſucceeds well when the ſilver is in ſo ſmall a proportion as that it would be protected from the action of the nitrous acid in the ordinary parting.

Inſtead of ſea ſalt, nitre may be uſed with equal ſucceſs: becauſe the nitrous acid is then put in a ſtate to attack the ſilver, notwithſtanding the quantity of gold which covers it.

Dry Parting. Dry parting, or parting by fuſion, is performed by ſulphur, which has the property of uniting eaſily with ſilver, while it does not attack gold.

This method of ſeparating theſe two metals would be the cheapeſt, the moſt expeditious and convenient of any, if the ſulphur could diſſolve the ſilver, and ſeparate it from the gold as well and as eaſily as nitrous acid does: but, on the contrary, we are obliged to employ a particular treatment, and a kind of concentration, to begin the union of the ſulphur allayed with gold. Then repeated and troubleſome fuſions muſt be made, in each of which we are obliged to add different intermediate ſubſtances, and particularly the metals which have the ſtrongeſt affinity with ſulphur, to aſſiſt the precipitation, which in that caſe does not give a regulus of pure gold, but a gold ſtill allayed with much ſilver, and even with a part of the precipitating metals; ſo that, to complete the operation, cupellation is neceſſary, and alſo parting by aquafortis.

From what we have ſaid concerning this operation, we may perceive, that it ought not to be made but when the quantity of ſilver with which the gold is allayed is ſo great, that the quantity of gold which might be obtained by the ordinary parting is not ſufficient to pay the expences; and that it is only proper for concentrating a larger quantity of gold in a ſmaller quantity of ſilver. As this dry parting is troubleſome, and even expenſive, it ought not to be undertaken but on a conſiderable quantity of ſilver allayed with gold. Accordingly Cramer, Schlutter, Schlinder, and all good chemiſts and artiſts, who have given proceſſes for the dry parting, recommend its uſe only in the above-mentioned caſes. We wiſh that this operation could be improved: it would be much more advantageous if it could be done by two or three fuſions; and if by theſe an exact ſeparation could be obtained of a ſmall quantity of gold mixed with a large quantity of ſilver. *Chem. Dict.*

As this operation for extracting a ſmall quantity of gold from a large quantity of ſilver is, notwithſtanding its inconveniences, approved by Schlutter, Scheffer, and other authors, and practiſed in Hartz, we ſhall add what Dr Lewis, in his excellent Hiſtory of Gold, has ſaid upon the ſubject.

The moſt advantageous method of ſeparating a ſmall portion of gold from a large one of ſilver, appears to be by means of ſulphur, which unites with and ſcorifies the ſilver without affecting the gold; but as ſulphurated ſilver does not flow thin enough to ſuffer the ſmall particles of gold diffuſed through it to reunite and ſettle at the bottom, ſome addition is neceſſary for collecting and carrying them down.

In order to the commixture with the ſulphur, 50 or 60 pounds of the mixed metal, or as much as a large crucible will receive, are melted at once, and reduced into grains, by taking out the fluid matter, with a ſmall crucible made red hot, and pouring it into cold water ſtirred with a rapid circular motion. From an eighth to a fifth of the granulated metal, according as it is richer or poorer in gold, is reſerved, and the reſt well mingled with an eighth of powdered ſulphur. The grains enveloped with the ſulphur are again put into the crucible, and the fire kept gentle for ſome time, that the ſilver, before it melts, may be thoroughly penetrated by the ſulphur; if the fire was haſtily urged, great part of the ſulphur would be diſſipated, without acting upon the metal.

If to ſulphurated ſilver in fuſion pure ſilver be added, the latter falls to the bottom, and forms there a diſtinct fluid not miſcible with the other. The particles of gold, having no affinity with the ſulphurated ſilver, join themſelves to the pure ſilver, wherever they come in contact with it, and are thus transferred from the former into the latter, more or leſs perfectly according as the pure ſilver was more or leſs thoroughly diffuſed through the mixed. It is for this uſe that a part of the granulated metal was reſerved. The ſulphurated maſs being brought into perfect fuſion, and kept melted for near an hour in a cloſe covered crucible, one-third of the reſerved grains is thrown in; and as ſoon as this is melted, the whole is well ſtirred, that the freſh ſilver may be diſtributed through the mixed, to collect the gold from it. The ſtirring is performed with a wooden rod; an iron one would be corroded by the ſulphur, ſo as to deprive the mixed of its due quantity of ſulphur, and likewiſe render the ſubſequent purification of the ſilver more troubleſome. The fuſion being continued an hour longer, another third of the unſulphurated grains is added, and an hour after this the remainder; after which the fuſion is further continued for ſome time, the matter being ſtirred at leaſt every half hour from the beginning to the end, and the crucible kept cloſely covered in the intervals.

The ſulphurated ſilver appears in fuſion of a dark brown colour; after it has been kept melted for a certain time, a part of the ſulphur having eſcaped from the top, the ſurface becomes white, and ſome bright drops of ſilver, about the ſize of peaſe, are perceived on it. When this happens, which is commonly in about three hours after the laſt addition of the reſerved grains, ſooner or later according as the crucible has been more or leſs cloſely covered, and the matter more or leſs ſtirred, the fire muſt be immediately diſcontinued; for otherwiſe more and more of the ſilver, thus loſing its ſulphur, would ſubſide and mingle with the part at the bottom in which the gold is collected. The whole is poured out into an iron mortar greaſed and duly heated; or if the quantity is too large to be ſafely lifted at once, a part is firſt taken out from the top with a ſmall crucible, and the reſt poured into the mortar. The gold, diffuſed at firſt through the whole maſs, is now found collected into a part of it at the bottom, amounting only to about as much as was reſerved unſulphurated. This part may be ſeparated from the ſulphurated ſilver above it by a chiſſel and hammer; or more perfectly, the ſurface of the lower maſs being generally rugged and unequal, by placing the whole maſs with its bottom upwards in a crucible: the ſulphurated part quickly melts, leaving unmelted that which contains the gold, which may thus be completely ſeparated from the other. The ſulphurated ſilver is eſſayed by keeping a portion of it in fuſion in an open crucible till the ſulphur is diſſipated, and then diſſolving it in aquafortis. If it ſhould ſtill be found to contain any gold, it is to be melted again; as much more unſulphurated ſilver is to be added as was employed in each of the former injections, and the fuſion continued about an hour and a half.

The gold thus collected into a part of the ſilver may be further concentrated into a ſmaller part, by granulating the maſs and repeating the whole proceſs. The operation may be again and again repeated, till ſo much of the ſilver is ſeparated, that the remainder may be parted by aquafortis without too much expence.

The foregoing proceſs, according to Mr Schlutter, is practiſed at Rammelſberg in the Lower Hartz. The prevailing metal in the ore of Rammelſberg is lead: the quantity of lead is at moſt 40 pounds on a quintal or 100 pounds of the ore. The lead worked off on a teſt or concave hearth yields about 110 grains of ſilver, and the ſilver contains only a 384th part of gold; yet this little quantity of gold, amounting ſcarcely to a third of a grain in a hundred weight of this ore, is thus collected with profit. The author above mentioned confines this method of ſeparation to ſuch ſilver as is poor in gold, and reckons parting with aquafortis more advantageous where the gold amounts to above a 64th of the ſilver: he adviſes alſo not to attempt concentrating the gold too far, as a portion of it will always be taken up again by the ſilver. M. Scheffer, however, relates (in the Swediſh Memoirs for the year 1752), that he has by this method brought the gold to perfect fineneſs; and that he has likewiſe collected all the gold which the ſilver contained; the ſilver of the laſt operations, which had taken up a portion of the gold, being reſerved to be worked over again with a freſh quantity of gold holding ſilver. The ſulphurated ſilver is purified by continuing it in fuſion for ſome time with a large ſurface expoſed to the air; the ſulphur gradually exhales, and leaves the ſilver entire.

PARTISAN, in the art of war, a perſon dexterous in commanding a party; who, knowing the country well, is employed in getting intelligence, or ſurpriſing the enemy's convoy, &c. The word alſo means an officer ſent out upon a party, with the command of a body of light troops, generally under the appellation of the partiſan's corps. It is alſo neceſſary that this corps ſhould be compoſed of infantry, light horſe, and huſſars.

PARTNERSHIP, is a contract among two or more perſons, to carry on a certain buſineſs, at their joint expence, and ſhare the gain or loſs which ariſes from it. Of this there are four kinds.

I. Occaſional joint trade, where two or more merchants agree to employ a certain ſum in trade, and divide the gain or loſs ſo ſoon as the adventure is brought to an iſſue. This kind of contract being generally private, the parties concerned are not liable for each other. If one of them purchaſe goods on truſt, the furniſher, who grants the credit through confidence in him alone, has no recourſe, in caſe of his inſolvency, againſt the other partners. They are only anſwerable for the ſhare of the adventure that belongs to the inſolvent partner.

If it be propoſed to carry the adventure farther than originally agreed on, any partner may withdraw his intereſt; and if it cannot be ſeparated from the others, may inſiſt that the whole ſhall be brought to an iſſue.

II. Standing companies, which are generally eſtabliſhed by written contract between the parties, where the ſtock, the firm, duration, the diviſion of the gain or loſs, and other circumſtances, are inſerted.

All the partners are generally authorized to ſign by the firm of the company, though this privilege may be confined to ſome of them by particular agreement. The firm ought only to be ſubſcribed at the place where the copartnery is eſtabliſhed. If a partner has occaſion, when abſent, to write a letter relating to their affairs, he ſubſcribes his own name on account of the company. When the ſame partners carry on buſineſs at different places, they generally chooſe different firms for each. The ſignature of each partner is generally ſent to new correſpondents; and when a partner is admitted, although there be no alteration in the firm, his ſignature is tranſmitted, with an intimation of the change in the copartnery to all their correſpondents. Houſes that have been long eſtabliſhed, often retain the old firm, though all the original partners be dead or withdrawn.

The powers of each partner are, in general, diſcretionary; but they ought not to act, in matters of importance, without conſulting together, when there is an opportunity. No partner is liable to make good the loſs ariſing from his judging wrong in a caſe where he had authority to act. If he exceeds his power, and the event prove unſucceſsful, he muſt bear the loſs; but if it prove ſucceſsful, the gain belongs to the company: yet if he acquaints the company immediately of what he has done, they muſt either acquieſce therein, or leave him the chance of gain, as well as the riſk of loſs.

All debts contracted under the firm of the company are binding on the whole partners, though the money was borrowed by one of them for his private uſe, without the conſent of the reſt. And if a partner exceeds his power, the others are nevertheleſs obliged to implement his engagements; though they may render him reſponſible for his miſbehaviour.

Although the ſums to be advanced by the partners be limited by the contract, if there be a neceſſity for raiſing more money to anſwer emergencies or pay the debts of the company, the partners muſt furniſh what is neceſſary, in proportion to their ſhares.

A debt to a company is not cancelled by the private debts of the partner: and when a partner becomes inſolvent, the company is not bound for his debts beyond the extent of his ſhare.

The debts of the company are preferable, on the company's effects, to the private debts of the partners.

Partnerſhip is generally diſſolved by the death of a partner; yet, when there are more partners than two, it may, by agreement, ſubſiſt among the ſurvivors. Sometimes it is ſtipulated, that, in caſe of the death of a partner, his place ſhall be ſupplied by his ſon, or ſome other perſon condeſcended on. The contract ought to ſpecify the time and manner in which the ſurviving partners ſhall reckon with the executors of the deceaſed for his ſhare of the ſtock, and a reaſonable time allowed for that purpoſe.

When partnerſhip is diſſolved, there are often outſtanding debts that cannot be recovered for a long time, and effects that cannot eaſily be diſpoſed of. The partnerſhip, though diſſolved in other reſpects, ſtill ſubſiſts for the management of their outſtanding affairs: and the money ariſing from them is divided among the partners, or their repreſentatives, when it is recovered. But as this may protract the final ſettlement of the company's affairs to a very inconvenient length, other methods are ſometimes uſed to bring them to a concluſion, either in conſequence of the original contract, or by agreement at the time of diſſolution. Sometimes the debts and effects are ſold by auction; ſometimes they are divided among the partners; and when there are two partners, one divides them into ſhares, as equal as poſſible, and the other chooſes either ſhare he thinks beſt.

If a partner withdraws, he continues reſponſible for his former partners till it be publicly known that he hath done ſo. A deed of ſeparation, regiſtered at a public office, is ſufficient preſumption of ſuch notoriety.

III. Companies, where the buſineſs is conducted by officers. There are many companies of this kind in Britain, chiefly eſtabliſhed for purpoſes which require a larger capital than private merchants can command. The laws with reſpect to theſe companies, when not confirmed by public authority, are the ſame as the former, but the articles of their agreement uſually very different. The capital is condeſcended on; and divided into a certain number of ſhares, whereof each partner may hold one or more, but is generally reſtricted to a certain number. Any partner may transfer his ſhare; and the company muſt admit his aſſignee as a partner. The death of the partners has no effect on the company. No partner can act perſonally in the affairs of the company: but the execution of their buſineſs is intruſted to officers, for whom they are reſponſible; and, when the partners are numerous, the ſuperintendency of the officers is committed to directors choſen annually, or at other appointed times, by the partners.

IV. Companies incorporated by authority. A royal charter is neceſſary to enable a company to hold lands, to have a common ſeal, and enjoy the other privileges of a corporation. A charter is ſometimes procured, in order to limit the riſk of the partners: for, in every private company, the partners are liable for the debts, without limitation; in corporated ſocieties, they are only liable for their ſhares in the ſtock of the ſociety. The incorporation of ſocieties is ſometimes authorized by act of parliament: but this high authority is not neceſſary, unleſs for conferring excluſive privileges.

Moral and Political Philoſophy.

Mr Paley ſays, "I know of nothing upon the ſubject of partnerſhip that requires explanation, but how the profits are to be divided where one partner contributes money and the other labour, which is a common caſe.

"*Rule.* From the ſtock of the partnerſhip deduct the ſum advanced, and divide the remainder between the moneyed partner and the labouring partner, in the proportion of the intereſt of the money to the wages of the labour, allowing ſuch a rate of intereſt as money might be borrowed for upon the ſame ſecurity, and ſuch wages as a journeyman would require for the ſame labour and truſt.

"*Example.* A advances 1000l. but knows nothing of the buſineſs; B produces no money, but has been brought up to the buſineſs, and undertakes to conduct it. At the end of the year the ſtock and effects of the partnerſhip amount to 1200l. conſequently there are 200l. to be divided. Now nobody would lend money upon the event of the buſineſs ſucceeding, which is A's ſecurity, under 6 *per cent.* therefore A muſt be allowed 60l. for the intereſt of his money. B, before he engaged in the partnerſhip, earned 30l. a-year in the ſame employment: his labour, therefore, ought to be valued at 30l. and the 200l. muſt be divided between the partners in the proportion of 60 to 30; that is, A muſt receive 133l. 6s. 8d. and B 66l. 13s. 4d. If there be nothing gained, A loſes his intereſt, and B his labour, which is right. If the original ſtock be diminiſhed, by this rule B loſes only his labour as before; whereas A loſes his intereſt and part of the principal; for which eventual diſadvantage A is compenſated, by having the intereſt of his money computed at 6 *per cent.* in the diviſion of the profits when there is any. It is true, that the diviſion of the profit is ſeldom forgotten in the conſtitution of the partnerſhip; and is therefore commonly ſettled by expreſs agreement; but theſe agreements, to be equitable, ſhould purſue the principle of the rule here laid down. All the partners are bound by what any one of them does in the courſe of the buſineſs; for, *quoad hoc*, each partner is conſidered as an authorized agent for the reſt."

PARTRIDGE, in ornithology. See TETRAO.

The partridge is ſo valuable at the table, that a great many ways of taking it have been invented by ſportſmen, all of which ſucceed from the natural folly and timidity of the animal.

The places partridges delight in moſt are corn fields, eſpecially whilſt the corn grows, for under that cover they ſhelter and breed: neither are thoſe places unfrequented by them when the corn is cut down, by reaſon of the grain they find there, eſpecially in wheat ſtubble, the height of which they delight in, being to them as a covert or ſhelter. When the wheat ſtubble is much trodden by men or beaſts, they then betake themſelves to the barley ſtubble, provided it be freſh and untrodden; and they will, in the furrows, amongſt the clots, branches, and long graſs, hide both themſelves and coveys, which are ſometimes 20 in number, nay 30, in a covey.

When the winter ſeaſon is arrived, and the ſtubble fields are ploughed up, or over-ſoiled with cattle, partridges reſort into the upland meadows, and lodge in the dead graſs, or fog, under hedges, amongſt mole hills, or under the roots of trees; ſometimes they reſort to coppices and underwoods, eſpecially if any corn fields are adjacent, or where there is grown broom, brakes, fern, &c.

In the harveſt time, when every field is full of men and cattle, in the day time they are found in the fallow fields which are next adjoining to the corn fields, where they lie lurking till evening or morning, and then they feed among the ſheaves of corn.

When their haunts are known, according to the ſituation of the country and ſeaſon of the year, the next care muſt be to find them out in their haunts, which is done ſeveral ways. Some do it by the eye only; and this art can never be taught, but learned by frequent experience, the colour of the birds being ſo like that of the earth at a diſtance, that no eye but a very converſant one could diſtinguiſh them. When they are once ſeen, the buſineſs is to keep the eye upon them, and then to keep in continual motion. They are a very lazy bird, and by this means will let a perſon almoſt tread upon them; though if the perſon ſtands ſtill to eye them, they will riſe immediately though they be at a conſiderable diſtance.

Another method of diſcovering them is, by going to their haunts very early in the morning, or at the cloſe of the evening, which is called the *jucking* time. The noiſe of the cock partridge is to be attended to at this time, and is very loud and earneſt. The hen will ſoon come up to the cock after her making the noiſe, which ſhe does by way of anſwer; and when they are got together, their chattering will diſcover them. Thus they may always be found at theſe times. But there is yet a better method of finding this bird, which is by the *call*. The buſineſs, in order to have ſucceſs in this way, is carefully to learn the notes of the partridge, and be able to imitate all the ſeveral ſounds. When perfect in this, the perſon is to go to the haunts morning and evening, and placing himſelf in ſome place where he can ſee the birds without being ſeen by them, he is to liſten to their calling; and when they are heard, he is to anſwer in the ſame notes, doubling again as they do: by continuing this, they may be brought ſo near, that the perſon lying down on his back may count their whole number. Having in this manner found where the birds are, the next care is to catch them.

They are ſo fooliſh, that it is extremely eaſy to take them in *nets*. In order to this, there needs no more than the going out, provided with two or three nets, with meſhes ſomewhat ſmaller than thoſe of the pheaſant nets, and walking round about the covey, a net is to be fixed ſo as to draw over them, on pulling a line at a diſtance. All this may be eaſily done; for ſo long as the ſportſman continues moving about, and does not fix his eye too intenſely upon them, they will let him come near enough to fix the net without moving. If they lie ſo ſtraggling, that one net will not cover them, then two or three muſt be fixed in the ſame manner. The ſportſman may then draw the nets over them, and they will often lie ſtill with the nets upon them till he comes up to fright them; then they will riſe, and be entangled in the net.

A ſecond method of taking them is with *bird lime*: this is done by means of wheat ſtraws. Theſe muſt be large, and cut off between knot and knot; they muſt be well limed with the beſt and ſtrongeſt bird lime, and the ſportſman muſt carry a great number out with him. Having found a field where there are partridges, he is to call; and if they anſwer, he is then to ſtick up the limed ſtraws in rows acroſs two or three lands, and going backward, call again to them, leading them on in the road where the ſtraws are: they will follow one another like a flock of chickens, and come out to the call; and will in their way run upon the ſtraws, and liming themſelves they will daub one another by crowding together, ſo that very few of them will be able to eſcape.

But there is yet a pleaſanter way of taking them than this, that is, by *driving* of them. In order to this, an engine is to be made of canvaſs ſtuffed with ſtraw, to repreſent a horſe; this horſe and nets are to be taken to the haunts of the partridges, and the nets being placed ſlanting or ſlopwiſe in the lower part of the field, the ſportſman is to take the wind in his back and get above them, driving them downwards; his face is to be covered with ſomething green or blue, and placing the horſe before him, he is to go towards them ſlowly and gently; and by this means they will be raiſed on their legs, but not on their wings, and will run before the horſe into the nets. If in the way they go into a wrong path, the horſe is to be moved to face them; and they will be thus driven back again, and driven every way the ſportſman pleaſes.

The partridges of Abyſſinia, we are told, are very large, being as big as *capons*.

In Jeremiah xvii. 11. we have the following curious paſſage: "As the partridge ſitteth on *eggs*, and hatcheth *them* not; ſo he that getteth riches, and not by right, ſhall leave them in the midſt of his days, and at his end ſhall be a fool;" which is explained by Mr Pool as follows: It is no wonder if we cannot be certain as to the ſenſe of theſe words, ſo far as they concern natural hiſtory, when we are not certain what bird it is to which this doth relate. We tranſlate it *partridge*: others will have it to be a *cuckoo*; but certain it is, that it is the ſame word which we tranſlate *partridge*, (1 Sam. xxvi. 20.); and cuckoos uſe not to be much hunted after. How the partridge is ſaid to ſit on eggs and hatch them not, is yet a greater queſtion. It may be occaſioned ſo many ways, viz. either ſitting upon wind eggs; or being killed before the eggs are hatched; or having its eggs deſtroyed by the male partridge, or by ſome dog or other vermine; or, its neſt being found, having her eggs taken from her, that it is hard to determine which the prophet means. Of all others, I leaſt approve of that which Jerome makes the ſenſe, though the thing be true (if we may believe Caſſiodorus and ſeveral natural hiſtorians, Aldrovandus, &c.), that partridges have ſuch a love and deſire to hatch young ones, that having loſt their own eggs, they will ſteal the eggs of other partridges, and hatch them; which being hatched, the young ones knowing the cry of their proper dams, hearing them call, leave the partridge that hatched them (which is one thing quoted by Aldrovandus, to ſhow the ſagacity of that bird); but if this were the ſenſe, the words would be, 'as the partridge ſitteth on eggs, and hatcheth them, but enjoyeth them not;" whereas they are, 'hatcheth them not;' that is, having loſt them, either by ſome man that hath taken them from her, or by ſome vermine or wild beaſt." *Pool's Annot. in Loc.*

The words in the original are, רכר ולא ילר קרא, which the Septuagint tranſlate εφωνησε περδιξ, &c. "The partridge cried; it gathered together what it had not produced;" and ſome tranſlate the Hebrew, "The partridge lays many eggs, but does not hatch them all." Le Clerc, upon the authority of Bocchart, underſtands the Hebrew word *kore* here to ſignify a *woodcock*. Le Clerc's tranſlation is as follows: *Ruſticula ova colligit, ſed non parit; facit ſibi divitias, ſed ſine jure, mediis ſuis diebus eas relinquit, atque ad extremum ſtulta eſt.*

PARTURITION, the art of bringing forth or being delivered of young. See Midwifery.

PARTY, in a military ſenſe, a ſmall number of men, horſe, or foot, ſent upon any kind of duty; as into an enemy's country to pillage, to take priſoners, and to oblige the country to come under contribution. Parties are often ſent out to view the roads and ways, get intelligence, ſeek forage; to reconnoitre, or amuſe the enemy upon a march: they are alſo frequently ſent upon the flanks of an army or regiment, to diſcover the enemy if near, and prevent ſurpriſe or ambuſcade.

PARU, in natural hiſtory, the name of a very ſingular American fiſh. It is broad, flat, and rounded; not very thick, and uſually of about five or ſix inches long, and more than four broad. It has ſix fins, one large and long, one on the back, and another on the belly behind the anus; each of theſe reaches to the tail, and has toward the end a long ſtring or cord, made of a ſingle filament, that on the back fin being longer than that on the belly; behind the gills it has alſo two fins of two fingers breadth long and one broad; and two others on the belly, which are very narrow; its head is ſmall, and its mouth elevated and ſmall, and furniſhed with ſmall teeth; its ſcales are of a moderate ſize, and are half black and half yellow, ſo that the fiſh appears of a black colour, variegated with yellow half moons; its gills, and the beginning of its fins, are alſo yellow; and it has, on each ſide near the head, a yellow ſpot; it is eatable.

PARVICH, an iſland near Dalmatia, and one of the beſt peopled and moſt conſiderable of thoſe which are under the juriſdiction of Sibenico. It contains a great number of fiſhermen, and a conſiderable number of perſons who give themſelves up to agriculture. It contains many Roman antiquities, which evidently ſhow that it was a Roman ſtation. It ſeems to be among the number of thoſe iſlands which Pliny calls *Celaduſſæ*, which is ſuppoſed to be an inverſion of δυσκελαδος, which means *ill ſounding* or *noiſy*. Parvich is not of large extent, but it is extremely fertile. Every product ſucceeds in perfection there: we mean thoſe products of which a very ſhallow ground is ſuſceptible; ſuch as wine, oil, mulberry trees, and fruit. The aſpect of this iſland is alſo very pleaſant at a diſtance, whereas that of the others adjacent diſguſts the eye, by their too high, rocky, and bare hills. The name of *Parvich* ſeems to have been given it becauſe it is the firſt one meets with on going out of the harbour of Sibenico; for the Illyric word *parvi* ſignifies *firſt*.

PARULIDES, in ſurgery, tumors and inflammations of the gums, commonly called *gum boils*. They are to be treated with diſcutients like other inflammatory tumors.

PARUS, or Titmouse, in ornithology, a genus belonging to the order of paſſeres. The bill is very entire, covered at the baſis with hairs; the tongue is truncated and hairy. There are 14 ſpecies; of which the moſt remarkable are,

1. The criſtatus, or creſted titmouſe, weighs 13 pennyweight; the bill is black, with a ſpot of the ſame colour above it; all the upper part of the body gray, the neck and under parts are white, with a faint tincture of red, which is deepeſt juſt below the wings. The legs are of a lead colour. It erects its crown feathers into a creſt. It inhabits the warm parts of North America; and frequents foreſt trees, feeding upon inſects.

2. The major, or great titmouſe, has the head and throat black, the cheeks white, the back of a green colour, the belly yellowiſh green, divided in the middle by a bed of black which extends to the vent; the rump of a bluiſh gray, the legs of a lead colour, the toes divided to the very origin, and the back toe very large and ſtrong. This ſpecies ſometimes viſits our gardens; but for the moſt part inhabits woods, where it builds in hollow trees, laying about ten eggs. It feeds on inſects, which it finds in the bark of trees. In the ſpring they do a great deal of miſchief by picking off the tender buds of the fruit trees. Like woodpeckers, they are perpetually running up and down the bodies of trees in queſt of food. This bird has three cheerful notes, which it begins to utter in the month of February.

3. The cœruleus, or blue titmouſe, is a very beautiful bird. The bill is ſhort and duſky; the crown of the head of a fine blue; from the bill to the eyes is a black line; the forehead and cheeks white; the back of a yellowiſh green; the lower ſide of the body yellow; the wings and tail blue, the former marked tranſverſely with a white bar; the legs of a lead colour. They frequent gardens; and do great injury to fruit trees, by bruiſing the tender buds in ſearch of the inſects which lie under them. It breeds in holes of walls, and lays 12 or 14 eggs.

4. The virginianus, or yellow rump, is found in Virginia; and is diſtinguiſhed by a yellow ſpot on its rump. All the reſt of the feathers are brown, with a ſlight tincture of green. It runs about the bodies of trees; and feeds on inſects, which it pecks from the crevices of the bark.

5. The caudatus, or long-tailed titmouſe, is about five inches and a quarter in length, and ſeven inches in breadth. The bill is black, very thick and convex,

differing from all others of this genus. The top of the head, from the bill to the hind part, is white, mixed with a few dark gray feathers: this bed of white is entirely ſurrounded with a broad ſtroke of black; which riſing on each ſide of the upper mandible, paſſes over each eye, unites at the hind part of the head, and continues along the middle of the back to the rump. The feathers on each ſide of this black ſtroke are of a purpliſh red, as are thoſe immediately incumbent on the tail. The tail is the longeſt, in proportion to the bulk, of any Britiſh bird, being in length three inches, the form not unlike that of a magpie, conſiſting of 12 feathers of unequal lengths, the middlemoſt the longeſt, thoſe on each ſide growing gradually ſhorter. Theſe birds are often ſeen paſſing through our gardens, going from one tree to another, as if in their road to ſome other place, never making any halt. They make their neſts with great elegance, of an oval ſhape, and about eight inches deep, having near the upper end a hole for admiſſion. The external materials are moſſes and lichens curiouſly interwoven with wool. On the inſide it is very warmly lined with a thick bed of feathers. The female lays from 10 to 17 eggs. The young follow their parents the whole winter; and, from the ſlimneſs of their bodies, and great length of tail, appear, while flying, like as many darts cutting the air.

6. The biarmicus, or bearded titmouſe, has a ſhort, ſtrong, and very convex bill, of box colour; the head of a fine gray; the chin and throat white; the middle of the breaſt fleſh coloured; the ſides and thighs of a pale orange; the hind part of the neck and back of orange bay; the tail is two inches and three quarters long; the legs of a deep ſhining black. The female wants the fleſh colour on the breaſt, and a triangular tuft of black feathers on each ſide the bill which adorn the male. They are found in marſhy places.

7. The remiz, or ſmall ſpecies of titmouſe. It is called *parus pendulinus*, and is often found in Lithuania. Mr Coxe, in his Travels through Poland, gives the following account of this little animal. "The wondrous ſtructure of its pendent neſt induced me to give an engraving † of both that and the birds themſelves. They are of the ſmalleſt ſpecies of titmice. The head is of a very pale bluiſh aſh colour; the fore part of the neck and the breaſt tinged with red; the belly white; wings black; back and rump of a yellowiſh ruſt colour; quill feathers cinereous, with the exterior ſides white; the tail ruſt coloured. The male is ſingularly diſtinguiſhed from the female by a pair of black-pointed whiſkers. Its neſt is in the ſhape of a long purſe, which it forms with amazing art, by interweaving down, goſſamer, and minute fibres, in a cloſe and compact manner, and then lining the inſide with down alone, ſo as to make a ſnug and warm lodge for its young brood. The entrance is at the ſide, ſmall, and round, with its edge more ſtrongly marked than the reſt of this curious fabric: the bird, attentive to the preſervation of its eggs or little ones from noxious animals, ſuſpends it at the leſſer end to the extremity of the ſlender twigs of a willow or ſome other tree over a river. Contrary to the cuſtom of titmice, it lays only four or five eggs: poſſibly Providence hath ordained this ſcantineſs of eggs to the remiz, becauſe by the ſingular inſtinct imparted to it, it is enabled to ſecure its young much more effectually from deſtruction, than the other ſpecies, which are very prolific."

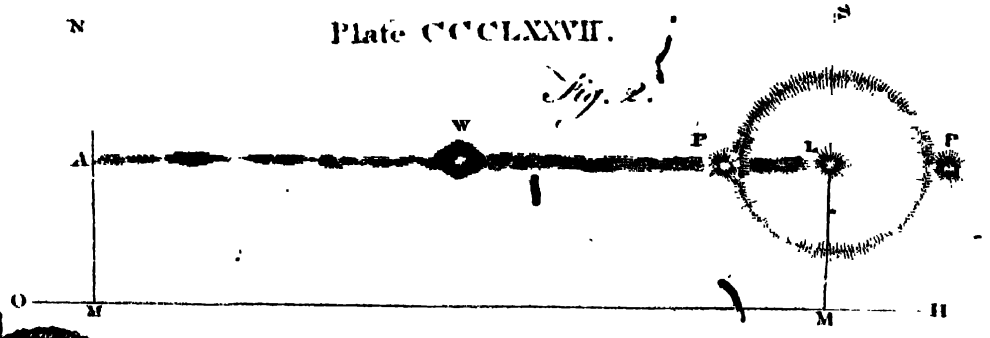
† See Plate CCCLXXVII.

PASCAL (Blaiſe), one of the greateſt geniuſes and beſt writers France has produced, was born at Clermont in Auvergne, in the year 1623. His father, Stephen Paſcal, born in 1588, and of an ancient family, was preſident of the court of aids in his province: he was a very learned man, an able mathematician, and a friend of Deſcartes. Having an extraordinary tenderneſs for this child, his only ſon, he quitted his office in his province, and went and ſettled at Paris in 1631, that he might be quite at leiſure for the inſtruction of him; and Blaiſe never had any maſter but his father. From his infancy he gave proofs of a very extraordinary capacity: for he deſired to know the reaſon of every thing; and when good reaſons were not given him, he would ſeek for better; nor would he ever yield his aſſent but upon ſuch as appeared to him well grounded. There was room to fear, that with ſuch a caſt of mind he would fall into free-thinking, or at leaſt into heterodoxy; yet he was always very far from any thing of this nature.

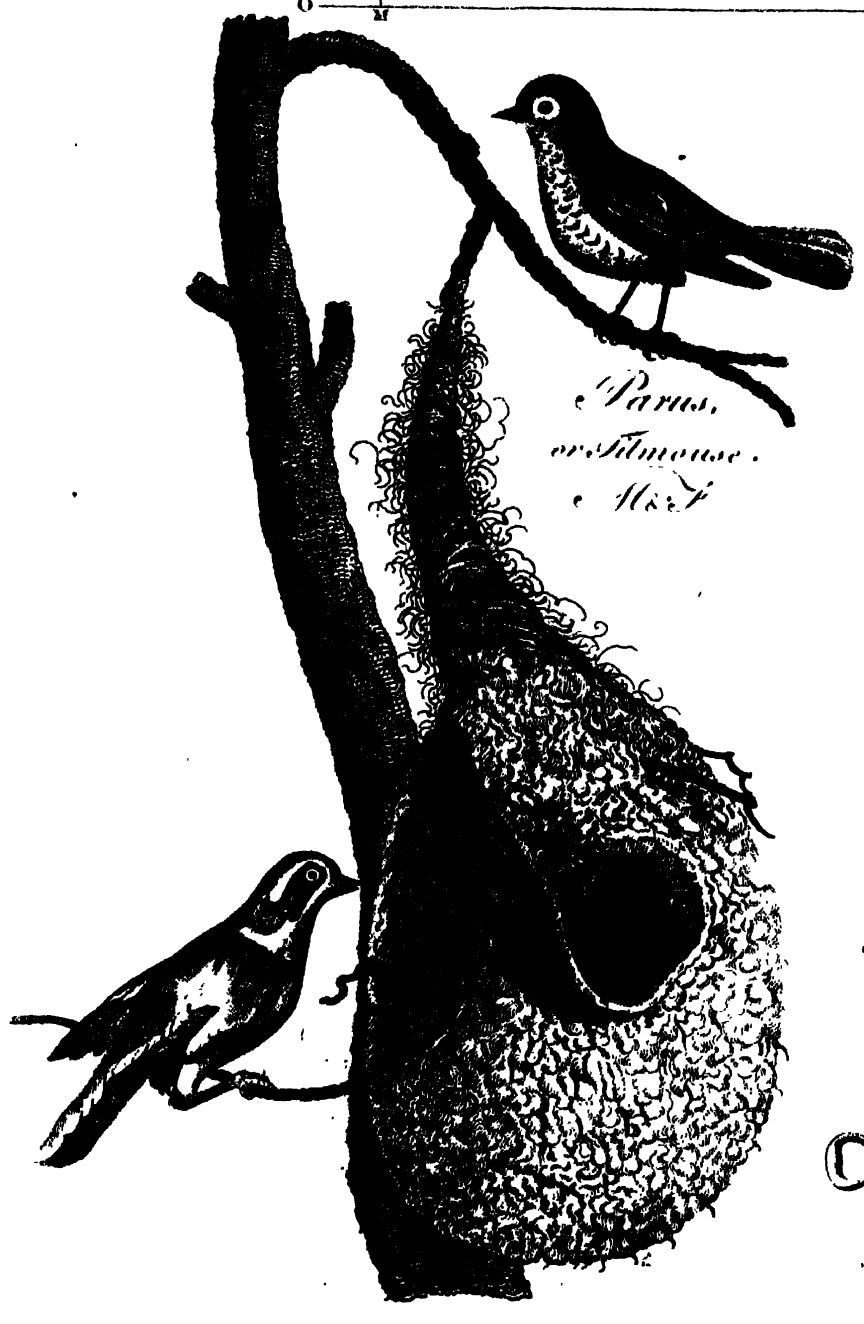
What is told of his manner of learning the mathematics, as well as the progreſs he quickly made in that ſcience, ſeems almoſt miraculous. His father, perceiving in him an extraordinary inclination to reaſoning, was afraid leſt the knowledge of the mathematics would hinder his learning the languages. He kept him therefore as much as he could from all notions of geometry, locked up all his books of that kind, and refrained even from ſpeaking of it in his preſence. He could not, however, make his ſon refrain from muſing upon proportions; and one day ſurpriſed him at work with charcoal upon his chamber floor, and in the midſt of figures. He aſked him what he was doing? I am ſearching, ſays Paſcal, for ſuch a thing; which was juſt the 32d propoſition of the firſt book of Euclid. He aſked him then how he came to think of this? It was, ſays Paſcal, becauſe I have found out ſuch another thing: and ſo going backward, and uſing the names of *bar* and *round*, he came at length to the definitions and axioms he had formed to himſelf. Does it not ſeem miraculous that a boy ſhould work his way into the heart of a mathematical book, without ever having ſeen that or any other book upon the ſubject, or knowing any thing of the terms? Yet we are aſſured of the truth of this by Madame Perier, and ſeveral other writers, the credit of whoſe teſtimony cannot reaſonably be queſtioned. He had, from henceforward, full liberty to indulge his genius in mathematical purſuits. He underſtood Euclid's Elements as ſoon as he caſt his eyes upon them: and this was not ſtrange; for, as we have ſeen, he underſtood them before. At 16 years of age he wrote a treatiſe of conic ſections, which was accounted by the moſt learned a mighty effort of genius; and therefore it is no wonder that Deſcartes, who had been in Holland a long time, ſhould, upon reading it, chooſe to believe that Mr Paſcal the father was the real author of it. At 19, he contrived an admirable arithmetical machine, which was eſteemed a very wonderful thing, and would have done credit as an invention to any man verſed in ſcience, and much more to ſuch a youth.—About this time his health became impaired, and he was in conſequence obliged to ſuſpend his labours;

Plate CCCLXXVII.

Fig. 2.

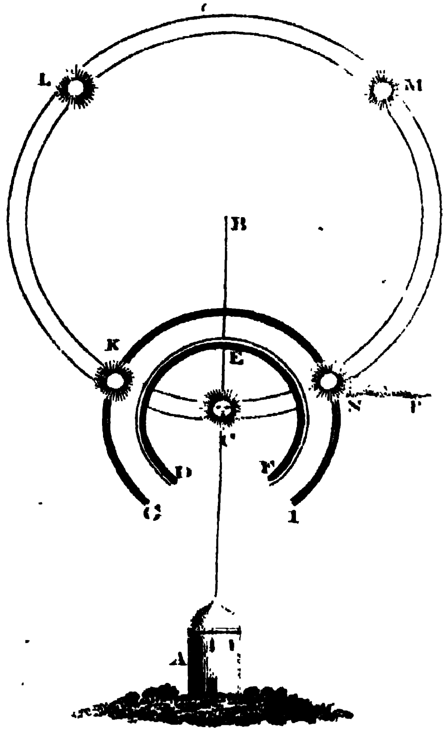


Parus, or Titmouse. Nº 7

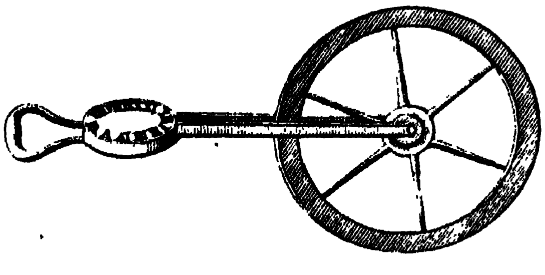


Parhelion.

Fig. 1.



Perambulator.



A. Bell Prin. Wal. Sculptor fecit

nor was he in a condition to reſume them till four years after. About that period, having ſeen Torricelli's experiment reſpecting a vacuum and the weight of the air, he turned his thoughts towards theſe objects; and in a conference with M. Petit, intendant of fortifications, propoſed to make farther reſearches. In conſequence of this idea, he undertook ſeveral new experiments, one of which was as follows: Having provided a glaſs tube, 46 feet in length, open at one end, and ſealed hermetically at the other, he filled it with red wine, that he might diſtinguiſh the liquor from the tube. He then elevated it in this condition; and having placed it perpendicularly to the horizon, ſtopped up the bottom, and plunged it into a veſſel full of water, to the depth of a foot; after which he opened the extremity of the tube, and the wine deſcended to the diſtance of about 32 feet from the ſurface of the veſſel, leaving a conſiderable vacuum at the upper extremity. He next inclined the tube, and remarked that the wine roſe higher; and having inclined it till the top was within 32 feet of the ground, making the wine thus run out, he found that the water roſe in it, ſo that it was partly filled with that fluid, and partly with wine. He made alſo a great many experiments with ſiphons, ſyringes, bellows, and all kinds of tubes, making uſe of different liquors, ſuch as quickſilver, water, wine, oil, &c.; and having publiſhed them in 1647, diſperſed his work throughout all France, and tranſmitted it alſo to foreign countries. All theſe experiments, however, aſcertained effects, without demonſtrating the cauſes. Paſcal knew that Torricelli conjectured that thoſe phenomena which he had obſerved were occaſioned by the weight of the air (A); and in order to diſcover the truth of this theory, he made an experiment at the top and bottom of a mountain in Auvergne, called *Le Puy de Dome*, the reſult of which gave him reaſon to conclude that air was weighty. Of this experiment he publiſhed an account, and ſent copies of it to moſt of the learned men in Europe. He likewiſe renewed it at the top of ſeveral high towers, ſuch as thoſe of Notre Dame at Paris, St Jaçques de la Boucherie, &c.; and always remarked the ſame difference in the weight of the air, at different elevations. This fully convinced him of the weight of the atmoſphere; and from this diſcovery he drew many uſeful and important inferences. He compoſed alſo a large treatiſe, in which he thoroughly explained this ſubject, and replied to all the objections that had been ſtarted againſt it. As he thought this work rather too prolix, and as he was fond of brevity and preciſion, he divided it into two ſmall treatiſes, one of which he entitled, A Diſſertation on the Equilibrium of Liquors; and the other, An Eſſay on the Weight of the Atmoſphere. Theſe labours procured Paſcal ſo much reputation, that the greateſt mathematicians and philoſophers of the age propoſed various queſtions to him, and conſulted him reſpecting ſuch difficulties as they could not ſolve.—Some years after, while tormented with a violent fit of the toothach, he diſcovered the ſolution of a problem propoſed by Father Merſenne, which had baffled the penetration of all thoſe who had attempted it. This problem was to determine the curve deſcribed in the air by the nail of a coach wheel, while the machine is in motion. Paſcal offered a reward of 40 piſtoles to any one who ſhould give a ſatisfactory anſwer to it. No one, however, having ſucceeded, he publiſhed his own at Paris; but as he began now to be diſguſted with the ſciences, he would not put his real name to it, but ſent it abroad under that of A. d'Ettenville.—This was the laſt work which he publiſhed in the mathematics; his infirmities now increaſing ſo much, that he was under the neceſſity of renouncing ſevere ſtudy, and of living ſo recluſe, that he ſcarcely admitted any perſon to ſee him.

After he had thus laboured abundantly in mathematical and philoſophical diſquiſitions, he forſook thoſe ſtudies and all human learning at once; and determined to know nothing, as it were, for the future, but Jeſus Chriſt and him crucified. He was not 24 years of age, when the reading ſome pious books had put him upon taking this holy reſolution; and he became as great a devotee as any age had produced. Mr Paſcal now gave himſelf up entirely to a ſtate of prayer and mortification. He had always in his thoughts theſe great maxims, of renouncing all pleaſure and all ſuperfluity; and this he practiſed with rigour even in his illneſſes, to which he was frequently ſubject, being of a very invalid habit of body: for inſtance, when his ſickneſs obliged him to feed ſomewhat delicately, he took great care not to reliſh or taſte what he eat. He had no violent affection for thoſe he loved; he thought it ſinful, ſince a man poſſeſſes a heart which belongs only to God. He found fault with ſome diſcourſes of his ſiſter, which ſhe thought very innocent; as if ſhe had ſaid upon occaſion, that ſhe had ſeen a beautiful woman, he would be angry, and tell her, that ſhe might raiſe bad thoughts in footmen and young people. He frequently wore an iron girdle full of points next to his ſkin; and when any vain thought came into his head, or when he took particular pleaſure in any thing, he gave himſelf ſome blows with his elbow, to redouble the prickings, and to recal himſelf to his duty.

Though Mr Paſcal had thus abſtracted himſelf from the world, yet he could not forbear paying ſome attention to what was doing in it; and he even intereſted himſelf in the conteſt between the Jeſuits and the Janſeniſts. The Jeſuits, though they had the popes and kings on their ſide, were yet decried by the people, who brought up afreſh againſt them the aſſaſſination of Henry the Great, and all the old ſtories that were likely to make them odious. Paſcal went farther; and by his *Lettres Provinciales* (B), publiſhed in

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(A) Before this period, all thoſe effects which are now known to be produced by the weight of the atmoſphere, were attributed to Nature's abhorrence of a vacuum.

(B) The origin of theſe letters was this: for the ſake of unbending his mind, Paſcal uſed often to go to Port Royal des Champs, where one of his ſiſters had taken the veil, and where he had an opportunity of ſeeing the celebrated Mr. Arnaud, and ſeveral of his friends. This gentleman's diſpute with the Doctors of the

1656, under the name of *Louis de Montalte*, made them the ſubject of ridicule. "Theſe letters (ſays Voltaire) may be conſidered as a model of eloquence and humour. The beſt comedies of Moliere have not more wit than the firſt part of theſe letters; and the ſublimity of the latter part of them is equal to any thing in Boſſuet. It is true, indeed, that the whole book was built upon a falſe foundation; for the extravagant notions of a few Spaniſh and Flemiſh Jeſuits were artfully aſcribed to the whole ſociety. Many adſurdities might likewiſe have been diſcovered among the Dominican and Franciſcan caſuiſts; but this would not have anſwered the purpoſe; for the whole raillery was to be levelled only at the Jeſuits. Theſe letters were intended to prove, that the Jeſuits had formed a deſign to corrupt mankind; a deſign which no ſect of ſociety ever had, or can have." Voltaire calls Paſcal the firſt of their ſatiriſts; for Deſpreaux, ſays he, muſt be conſidered as only the ſecond. In another place, ſpeaking of this work of Paſcal, he ſays that "examples of all the various ſpecies of eloquence are to be found in it. Though it has been now written almoſt 100 years, yet not a ſingle word occurs in it, ſavouring of that viciſſitude to which living languages are ſo ſubject. Here then we are to fix the epocha when our language may be ſaid to have aſſumed a ſettled form. The biſhop of Lucon, ſon of the celebrated Buſſy, told me, that aſking one day the biſhop of Meaux what work he would covet moſt to be the author of, ſuppoſing his own performances ſet aſide, Boſſuet replied, The Provincial Letters." Theſe letters have been tranſlated into all languages, and printed over and over again. Some have ſaid, that there were decrees of formal condemnation againſt them; and alſo that Paſcal himſelf, in his laſt illneſs, deteſted them, and repented of having been a Janſeniſt: but both theſe particulars are falſe and without foundation. Father Daniel was ſuppoſed to be the anonymous author of a piece againſt them, entitled, *The Dialogues of Cleander and Eudoxus.*

Paſcal was only about the age of 30 when theſe letters were publiſhed, yet he was extremely infirm, and his diſorders increaſing ſoon after, ſo much that he conceived his end faſt approaching, he gave up all farther thoughts of literary compoſition. He reſolved to ſpend the remainder of his days in retirement and pious meditation; and with this view he broke off all his former connexions, changed his habitation, and ſpoke to no one, not even to his own domeſtics. He made his own bed, fetched his dinner from the kitchen, carried it to his apartment, and brought back the plates and diſhes in the evening; ſo that he employed his ſervants only to cook for him, to go to town, and to do ſuch other things as he could not abſolutely do himſelf. In his chamber nothing was to be ſeen but two or three chairs, a table, a bed, and a few books. It had no kind of ornament whatever; he had neither a carpet on the floor nor curtains to his bed; but this did not prevent him from ſometimes receiving viſits; and when his friends appeared ſurpriſed to ſee him thus without furniture, he replied, that he had what was neceſſary, and that any thing elſe would be a ſuperfluity, unworthy of a wiſe man. He employed his time in prayer, and in reading the Holy Scriptures; and he wrote down ſuch thoughts as this exerciſe inſpired. Though his continual infirmities obliged him to uſe very delicate food, and though his ſervants employed the utmoſt care to provide only what

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Sorbonne, who were endeavouring to condemn his opinions, was of courſe frequently brought upon the carpet. Mr Arnaud, ſolicited to write a defence, had compoſed a treatiſe, which, however, did not meet with approbation, and which he himſelf conſidered as a very indifferent work. Paſcal being one day in company, ſome of thoſe preſent, who were ſenſible of his abilities, having ſaid to him, "You who are a young man ought to do ſomething;" he took the hint, and compoſed a letter, which he ſhowed to his friends, and which was ſo much admired, that they inſiſted on its being printed. The object of this letter is an explanation of the terms, *next power*, *ſufficient grace*, and *actual grace*; and the author here ſhows, as well as in two others which followed it, that a regard for the faith was not the motive which induced the Doctors of the Sorbonne to enter into diſpute with Mr Arnaud, but a deſire of oppreſſing him by ridiculous queſtions. Paſcal, therefore, in other letters which he publiſhed afterwards, attacks the Jeſuits, whom he believed to be the authors of this quarrel; and in the moſt elegant ſtyle, ſeaſoned with wit and ſatire, endeavours to render them not only odious but ridiculous. For this purpoſe he employs the form of dialogue, and introduces an ignorant perſon, as men of the world generally are, who requeſts information reſpecting the queſtions in diſpute from theſe Doctors, whom he conſults by propoſing his doubts; and his anſwers to their replies are ſo conſpicuous, pertinent, and juſt, that the ſubject is illuſtrated in the cleareſt manner poſſible. He afterwards expoſes the morality of the Jeſuits, in ſome converſations between him and one of their caſuiſts, in which he ſtill repreſents a man of the world, who ſeeks for inſtruction, and who, hearing maxims altogether new to him, ſeems aſtoniſhed, but ſtill liſtens with moderation. The caſuiſt believes that he is ſincere, and reliſhes theſe maxims; and under this perſuaſion he diſcovers every thing to him with the greateſt readineſs. The other is ſtill ſurpriſed; and as his inſtructor attributes this ſurpriſe only to the novelty of his maxims, he ſtill continues to explain himſelf with the ſame confidence and freedom. This inſtructor is a ſimple kind of man, who is not overburdened with acuteneſs, and who inſenſibly engages himſelf in details which always become more particular. The perſon who liſtens, wiſhing neither to contradict him nor to ſubſcribe to his doctrine, receives it with an ambiguous kind of raillery; which, however, ſufficiently ſhows what opinion he entertains of it. The Jeſuits reproached the author with having employed only raillery againſt them, and with having miſrepreſented ſeveral paſſages of their authors; which induced Paſcal to write eight more in vindication of himſelf. All theſe letters, in number 18, written in a ſtyle altogether new in France, appeared in 4to, one after another, from the month of January 1656, to the month of March of the year following.

what was excellent, he never reliſhed what he ate, and ſeemed quite indifferent whether what they brought him was good or bad. When any thing new and in ſeaſon was preſented to him, and when he was aſked, after he had finiſhed his repaſt, how he liked it, he replied, "You ought to have informed me beforehand, I ſhould have then taken notice of it." His indifference in this reſpect was ſo great, that though his taſte was not vitiated, he forbade any ſauce or ragout to be made for him which might excite his appetite. He took without the leaſt repugnance all the medicines that were preſcribed him for the re-eſtabliſhment of his health; and when Madame Perrier, his ſiſter, ſeemed aſtoniſhed at it, he replied ironically, that he could not comprehend how people could ever ſhow a diſlike to a medicine, after being appriſed that it was a diſagreeable one, when they took it voluntarily; for violence or ſurpriſe ought only to produce that effect.

Though Paſcal had now given up intenſe ſtudy, and though he lived in the moſt temperate manner, his health continued to decline rapidly; and his diſorders had ſo enfeebled his organs, that his reaſon became in ſome meaſure affected. He always imagined that he ſaw a deep abyſs on his left ſide, and he never would ſit down till a chair was placed there, to ſecure him from the danger which he apprehended. His friends did every thing in their power to baniſh this melancholy idea from his thoughts, and to cure him of his error, but without the deſired effect; for though he would become calm and compoſed for a little, the phantom would in a few moments again make its appearance and torment him. The cauſe of his ſeeing this ſingular viſion for the firſt time, is ſaid to have been as follows: His phyſicians, alarmed on account of the exhauſted ſtate to which he was reduced, had adviſed him to ſubſtitute eaſy and agreeable exerciſe for the fatiguing labours of the cloſet. One day, in the month of October 1654, having gone according to cuſtom to take an airing on the Pont de Neuilly, in a coach and four, the two firſt horſes ſuddenly took fright, oppoſite to a place where there was no parapet, and threw themſelves violently into the Seine; but the traces luckily giving way, the carriage remained on the brink of the precipice. The ſhock which Paſcal, in his languiſhing ſituation, muſt have received from this dreadful accident, may eaſily be imagined. It threw him into a fit, which continued for ſome time, and it was with great difficulty that he could be reſtored to his ſenſes. After this period his brain became ſo deranged, that he was continually haunted by the remembrance of his danger, eſpecially when his diſorders prevented him from enjoying ſleep. To the ſame cauſe was attributed a kind of viſion or ecſtaſy that he had ſome time after; a memorandum of which he preſerved during the remainder of his life in a bit of paper, put between the cloth and the lining of his coat, and which he always carried about him. Some of the Jeſuits had the baſeneſs and inhumanity to reproach this great genius with the derangement of his organs. In the Dictionary of Janſeniſt Books, he is called a *hypochondriat*, and a man of a *wrong head*, and a *bad heart*. But, as a celebrated writer has obſerved, Paſcal's diſorder had in it nothing more ſurpriſing or diſgraceful than a fever, or the vertigo. During the laſt years of his life, in which he exhibited a melancholy example of the humiliating reverſes which take place in this tranſitory ſcene, and which, if properly conſidered, might teach mankind not to be too proud of thoſe abilities which a moment may take from them, he attended all the ſalutations (c), viſited every church in which relicks were expoſed, and had always a ſpiritual almanack, which gave an account of all thoſe places where particular acts of devotion were performed. On this occaſion it has been ſaid, that "Religion renders great minds capable of little things, and little minds capable of great."

In company, Paſcal was diſtinguiſhed by the amiableneſs of his behaviour; by his eaſy, agreeable, and inſtructive converſation, and by great modeſty. He poſſeſſed a natural kind of eloquence, which was in a manner irreſiſtible. The arguments he employed for the moſt part produced the effect which he propoſed; and though his abilities entitled him to aſſume an air of ſuperiority, he never diſplayed that haughty and imperious tone which may often be obſerved in men of ſhining talents. The philoſophy of this great man conſiſted in renouncing all pleaſure, and every ſuperfluity. He not only denied himſelf the moſt common gratifications; but he took alſo without reluctance, and even with pleaſure, either as nouriſhment or as remedies, whatever was diſagreeable to the ſenſes; and he every day retrenched ſome part of his dreſs, food, or other things, which he conſidered as not abſolutely neceſſary. Towards the cloſe of his life, he employed himſelf wholly in pious and moral reflections, writing down thoſe which he judged worthy of being preſerved. The firſt piece of paper he could find was employed for this purpoſe; and he commonly put down only a few words of each ſentence, as he wrote them merely for his own uſe. The bits of paper upon which he had written theſe thoughts, were found after his death filed upon different pieces of ſtring, without any order or connexion; and being copied exactly as they were written, they were afterwards arranged and publiſhed.

The celebrated Bayle, ſpeaking of this great man, ſays, A hundred volumes of ſermons are not of ſo much avail as a ſimple account of the life of Paſcal. His humility and his devotion mortified the libertines more than if they had been attacked by a dozen of miſſionaries. In a word, Bayle had ſo high an idea of this philoſopher, that he calls him *a paradox in the human ſpecies*. "When we conſider his character (ſays he), we are almoſt inclined to doubt that he was born of a woman, like the man mentioned by Lucretius:

"*Ut vix humana videatur ſtirpe creatus.*"

Mr Paſcal died at Paris the 19th of Auguſt 1662, aged 39 years. He had been ſome time about a work againſt atheiſts and infidels, but did not live long enough to digeſt the materials he had collected. What was found among his papers was publiſhed under the title of *Penſées*, &c. or *Thoughts upon religion and other ſubjects*, and has been much admired. After his death appeared alſo two other little tracts; one of which is entitled, *The equilibrium of fluids;* and the other, *The weight of the maſs of air.*

(c) Certain ſolemn prayers, which are repeated at certain hours, and on certain days, in the Popiſh churches.

The works of Paſcal were collected in five volumes 8vo, and publiſhed at the Hague, by De Tune, and at Paris by Nyon ſenior, in 1779. This edition of Paſcal's works may be conſidered as the firſt publiſhed; at leaſt the greater part of them were not before collected into one body; and ſome of them had remained only in manuſcript. For this collection, the public were indebted to the Abbé Boſſu, and Paſcal deſerved to have ſuch an editor. "This extraordinary man (ſays he) inherited from nature all the powers of genius. He was a geometrician of the firſt rank, a profound reaſoner, and a ſublime and elegant writer. If we reflect, that in a very ſhort life, oppreſſed by continual infirmities, he invented a curious arithmetical machine, the elements of the calculation of chances, and a method of reſolving various problems reſpecting the cycloid; that he fixed in an irrevocable manner the wavering opinions of the learned reſpecting the weight of the air; that he wrote one of the completeſt works which exiſt in the French language; and that in his thoughts there are paſſages, the depth and beauty of which are incomparable—we ſhall be induced to believe, that a greater genius never exiſted in any age or nation. All thoſe who had occaſion to frequent his company in the ordinary commerce of the world acknowledged his ſuperiority; but it excited no envy againſt him, as he was never fond of ſhowing it. His converſation inſtructed, without making thoſe who heard him ſenſible of their own inferiority; and he was remarkably indulgent towards the faults of others. It may be eaſily ſeen by his Provincial Letters, and by ſome of his other works, that he was born with a great fund of humour, which his infirmities could never entirely deſtroy. In company, he readily indulged in that harmleſs and delicate raillery which never gives offence, and which greatly tends to enliven converſation; but its principal object generally was of a moral nature. For example, ridiculing thoſe authors who ſay, *My Book, my Commentary, my Hiſtory,* they would do better (added he) to ſay *Our Book, our Commentary, our Hiſtory;* ſince there are in them much more of other people's than their own." An elegant Latin epitaph was inſcribed on his tomb.

PASCHAL, ſomething belonging to the paſſover, or Eaſter. See PASSOVER and EASTER.

PAS-EP-A, the chief of the Lamas, particularly eminent for having invented characters for the Moguls. He was much eſteemed by the Chineſe, though the literati exclaimed againſt the manner in which the people demonſtrated their affection. There is ſtill at Pekin a *myau* or temple, built in honour of Paſ-ep-a in the time of the Mogul emperors. He died in 1279.

PASIPHAE (fab. hiſt.), daughter of the Sun by Perſeis, who married Minos king of Crete. She diſgraced herſelf by an unnatural paſſion for a bull, which we are told ſhe was enabled to gratify by means of the artiſt Dædalus. This celebrated bull had been given to Minos by Neptune, to be offered on his altars. But as the monarch refuſed to ſacrifice the animal on account of his beauty, the god revenged his diſobedience by inſpiring Paſiphaë with an unnatural love for him. This fable, which is univerſally believed by the poets, who obſerve, that the Minotaur was the fruit of this infamous commerce, is refuted by ſome writers: who ſuppoſe that the infidelity of Paſiphaë to her huſband was betrayed in her affection for an officer of the name of Taurus, and that Dædalus, by permitting his houſe to be the aſylum of the two lovers, was looked upon as acceſſory to the gratification of Paſiphaë's luſt. From this amour with Taurus, as it is farther remarked, the queen became mother of twins; and the name of *Minotaurus* ariſes from the reſemblance of the children to the huſband and the lover of Paſiphaë. Minos had four ſons by Paſiphaë, Caſtreus, Deucalion, Glaucus and Androgeus; and three daughters, Hecate, Ariadne, and Phædra.

PASQUIN, a mutilated ſtatue at Rome, in a corner of the palace of the Urſini. It takes its name from a cobler of that city called *Paſquin*, famous for his ſneers and gibes, and who diverted himſelf by paſſing his jokes on all that went through that ſtreet. After his death, as they were digging up the pavement before his door, they found in the earth the ſtatue of an ancient gladiator, well cut, but maimed and half-ſpoiled: this they ſet up in the place where it was found, and by common conſent named it *Paſquin*. Since that time all ſatires are attributed to that figure; and are either put into its mouth, or paſted upon it, as if they were written by Paſquin redivivus; and theſe are addreſſed by Paſquin to Marforio, another ſtatue at Rome. When Marforio is attacked, Paſquin comes to his aſſiſtance; and, when Paſquin is attacked, Marforio aſſiſts him in his turn; that is, the people make the ſtatues ſpeak juſt what they pleaſe.

PASQUINADE, a ſatirical libel faſtened to the ſtatue of Paſquin: theſe are commonly ſhort, witty, and pointed; and from hence the term has been applied to all lampoons of the ſame caſt.

PASS, or PASSADE, in fencing, an advance or leap forward upon the enemy. Of theſe there are ſeveral kinds; as paſſes within, above, beneath, to the right, the left, and paſſes under the line, &c. The meaſure of the paſs is when the ſwords are ſo near as that they may touch one another.

PASS, in a military ſenſe, a ſtrait and difficult paſſage, which ſhuts up the entrance into a country.

Paſs Parole, in military affairs, a command given at the head of an army, and thence communicated to the rear, by paſſing it from mouth to mouth.

PASSADE, in the manege, is a turn or courſe of a horſe backwards or forwards on the ſame ſpot of ground. Hence there are ſeveral ſorts of paſſades, according to the different ways of turning, in order to part or return upon the ſame tread, which is called *cloſing the paſſade;* as the paſſade of one time, the paſſade of five times, and the raiſed or high paſſades, into which the demivolts are made into curvets. See HORSEMANSHIP.

North-weſt PASSAGE. } See *North-Weſt Paſſage, North-*
North-eaſt PASSAGE. } *Eaſt Paſſage,* and POLE.

Right of **PASSAGE**, in commerce, is an impoſition or duty exacted by ſome princes, either by land or ſea in certain cloſe and narrow places in their territories on all veſſels and carriages, and even ſometimes on perſons or paſſengers, coming in or going out of ports, &c. The moſt celebrated paſſage of this kind in Europe is the Sound: the dues for paſſing which ſtrait belong to the king of Denmark, and are paid at Elſinore or Cronenburgh.

PASSANT, in heraldry, a term applied to a lion or other animal in a ſhield, appearing to walk leiſurely; for moſt beaſts, except lions, the *trippant* is frequently uſed inſtead of *paſſant*.

PASSAU, an ancient, handſome, and celebrated town of Germany, in Lower Bavaria, with a biſhop's ſee and fort. The houſes are well built, and the cathedral is thought to be the fineſt in all Germany. It is divided into four parts, three of which are fortified; but the other is only a ſuburb, and has nothing but an old caſtle in which the biſhop generally reſides. It is ſeated at the confluence of the rivers Inn and Iltz, in E. Long. 13. 34. N. Lat. 48. 26.

PASSAU, a biſhopric of Germany, lying between Lower Bavaria, Auſtria, and Bohemia. It extends not above 20 miles where largeſt; and has no conſiderable place, except the capital, which is of the ſame name.

PASSERAT (John), a celebrated profeſſor of eloquence in the royal college of Paris, and one of the politeſt writers of his time, was born at Troyes, in the province of Champagne, in 1534. He ſpent three years in ſtudying the law under the famous Cujacius at Bourges, where he became profeſſor of eloquence in 1572. He was an indefatigable ſtudent, paſſing frequently whole days without eating a morſel; yet to an extraordinary erudition he joined an uncommon politeneſs of manners and pleaſantry, having nothing of the mere ſcholar except the gown and hood. He gained the eſteem of the kings Charles IX. Henry III. and of all the men of wit and learning in his time. He died in 1602, and left ſeveral admired works behind him.

PASSERES, the name of a claſs of birds. See ZOOLOGY.

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